

IDAHO

DEPARTMENT OF FISH AND GAME

Jerry M. Conley, Director

FEDERAL AID IN FISH RESTORATION

Job Performance Report

Project F-71-R-12



REGIONAL FISHERIES MANAGEMENT INVESTIGATIONS

Job No. 1-a. Region 1 Mountain Lakes Investigations
Job No. 1-b. Region 1 Lowland Lakes Investigations
Job No. 1-c. Region 1 River and Stream Investigations
Job No. 1-d. Region 1 Technical Guidance

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JOB PERFORMANCE REPORT

State of: Idaho

Name: REGIONAL FISHERY MANAGEMENT
INVESTIGATIONS

Project No.: F-71-R-12

Title: Region 1 Mountain Lakes
Investigations

Job No.: 1-a

Period Covered: July 1, 1987 to June 30, 1988

ABSTRACT

During 1987, management personnel coordinated with the Forest Service, conservation officers, hatchery personnel, and sportsmen to manage mountain lakes in Region 1. Westslope cutthroat fry were stocked in 33 lakes. Grayling and golden trout were stocked in four lakes. One lake was stocked with brown trout fry. "Drive to" lakes were stocked with Hayspur stock catchable rainbow and brook trout fingerlings. Mountain lake releases in the region are summarized for the last 11 years.

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OBJECTIVES

1. To develop improved management plans for fish populations of mountain lakes in Region 1.
2. To evaluate selected mountain lakes, their fish populations, and angler satisfaction and preferences. Use new and existing information on angler use, water quality, species history, spawning potential, stocking success, and lake morphology to develop the potential of these waters for providing diverse angling experiences.

RECOMMENDATIONS

1. Follow recommendations in Tables 2 and 3 regarding even or odd year stocking. Stock lakes that have been missed for several years, and temporarily discontinue stocking lakes where stunted fish populations are known to exist.
2. Obtain late egg takes (spring spawning) from domestic Kamloops rainbow trout so that the proper size fry are available for mountain lake stocking. If this is not possible, switch rainbow stocking to a different stock of fish.
3. Continue species diversity program by utilizing westslope cutthroat and Kamloops rainbow. Obtain grayling and golden trout to provide unique mountain lake fisheries.
4. Use brown trout to control stunted brook trout populations.

TECHNIQUES USED

Information on mountain lakes in Region 1 was reviewed with hatchery personnel and individuals from other agencies and groups to coordinate releases of fish in 1987. The stocking program was based on previous history, reports of fishing quality, and availability of fish for release in 1987.

FINDINGS

In 1987, 33 lakes were stocked with westslope cutthroat, 3 with catchable rainbow, 1 with fingerling brook trout, 1 with brown trout fry, 3 with grayling, and 1 with golden trout (Table 1). Three lakes scheduled for stocking in 1987 were missed (Debt, Copper, and Silver). Four lakes scheduled for even year stocking were stocked in 1987 (Calahan, Caribou, Little Harrison, and Tin).

Table 1. Number and species of fish (fry except where noted) stocked into mountain lakes in Region 1 from 1977-1987.

Drainage	Lake	Surface acres	Year stocked	Number stocked	Stocking rate (fish/acre)	Stock of fish	Comments
<u>Kootenai</u>	Hidden (1-103)	50	1977	5,800	232	Henrys Lake cutthroat	
			1979	5,486	109	Henrys Lake cutthroat	
			1979	5,300	106	Kamloops rainbow	
			1981	15,922	318	Westslope cutthroat	
			1982	15,656	313	Kamloops rainbow'	
			1983	12,107	242	Henrys Lake cutthroat	
			1984	12,768	255	Kamloops rainbow	
			1985	12,512	250	Westslope cutthroat	
			1986	6,000	120	Westslope cutthroat	
			1987	12,500	250	Westslope cutthroat	
	Lake Mountain (Cut-off) (1-104)	7	1977	2,910	416	Henrys Lake cutthroat	
			1979	3,424	346	Henrys Lake cutthroat	
			1983	1,723	246	Henrys Lake cutthroat	
			1985	1,748	250	Westslope cutthroat	
			1987	1,750	250	Westslope cutthroat	
	West Fork (1-109)	12	1978	7,704	642	Henrys Lake cutthroat	
			1979	3,184	265	Kamloops rainbow	
			1981	6,704	559	Westslope cutthroat	
			1982	3,648	304	Kamloops rainbow	
			1983	3,016	251	Henrys Lake cutthroat	
			1984	3,010	251	Kamloops rainbow	
			1985	2,990	250	Westslope cutthroat	
			1986	4,495	375	Westslope cutthroat	
			1987	3,000	250	Westslope cutthroat	
	Long Mountain (1-112)	3	1987	1,000	333	Grayling	
	Parker	3	1979	2,220	740	Golden trout	
			1986	1,225	408	Golden trout	

Table 1. Continued.

Drainage	Lake	Surface acres	Year stocked	Number stocked	Stocking rate (fish/acre)	Stock of fish	Comments
Kootenai	Smith (Long Canyon) (1-115)	6	1987	2,000	333	Grayling	
	Big Fisher (1-117)	10	1977	6,295	630	Henry's Lake cutthroat	
			1979	3,030	303	Henry's Lake cutthroat	
			1981	3,352	335	Westslope cutthroat	
			1983	2,486	248	Henry's Lake cutthroat	
			1985	2,530	253	Westslope cutthroat	
			1987	2,500	250	Westslope cutthroat	
	Myrtle (1-122)	20	1977	6,240	312	Henry's Lake cutthroat	
			1979	6,060	303	Henry's Lake cutthroat	
			1983	5,189	259	Westslope cutthroat	
			1985	5,100	255	Westslope cutthroat	
			1987	5,000	250	Westslope cutthroat	
	Trout (1-124)	7	1977	2,562	366	Kamloops rainbow	
			1979	2,120	303	Kamloops rainbow	
			1981	2,514	359	Westslope cutthroat	
			1982	3,296	471	Kamloops rainbow	
			1983	1,720	247	Henry's Lake cutthroat	
			1984	1,733	248	Kamloops rainbow	
			1985	1,748	250	Westslope cutthroat	
			1986	1,721	246	Westslope cutthroat	
			1987	1,751	250	Westslope cutthroat	
	Pyramid (1-125)	11	1977	3,660	333	Kamloops rainbow	
			1977	81	7	Henry's Lake cutthroat	
			1979	3,710	337	Kamloops rainbow	
			1981	4,190	381	Westslope cutthroat	
			1982	3,296	300	Kamloops rainbow	
			1983	2,702	246	Henry's Lake cutthroat	
			1984	2,736	249	Kamloops rainbow	
			1985	2,760	251	Westslope cutthroat	
			1986	2,741	249	Westslope cutthroat	
			1987	2,750	250	Westslope cutthroat	

Table 1. Continued.

Drainage	Lake	Surface acres	Year stocked	Number stocked	Stocking		Comments
					rate (fish/acre)	Stock of fish	
<u>Kootenai</u>	Ball Creek (1-126)	6	1978	3,184	531	Henrys Lake cutthroat	
			1980	2,136	356	westslope cutthroat	
			1983	1,513	255	Henrys Lake cutthroat	
			1984	1,000	167	westslope cutthroat	
			1986	1,498	250	westslope cutthroat	
	Little Ball Creek (1-127)	4	1980	1,424	356	westslope cutthroat	
			1984	1,500	375	westslope cutthroat	
			1986	956	239	westslope cutthroat	
	Snow (1-134)	10	1978	3,184	318	Henrys Lake cutthroat	
			1979	3,030	303	Henrys Lake cutthroat	
			1982	3,008	301	westslope cutthroat	
			1983	2,872	287	Henrys Lake cutthroat	
			1987	2,500	250	westslope cutthroat	
	Roman Nose #3 (1-137)	12	1977	2,080	168	Catchable rainbow	
			1977	3,072	256	Henrys Lake cutthroat	
			1978	3,360	280	Henrys Lake cutthroat	
			1979	5,300	442	Kamloops rainbow	
			1983	2,320	193	Domestic Kamloops (size 2)	
			1985	3,000	250	westslope cutthroat	
			1986	3,000	250	westslope cutthroat	
			1987	3,000	250	westslope cutthroat	
	Solomo (1-146)	9	1977	3,120	347	Henrys Lake cutthroat	
			1978	4,704	523	Henrys Lake cutthroat	
			1979	5,062	562	Kamloops rainbow	
			1982	3,040	338	Kamloops rainbow	
			1983	2,162	240	Henrys Lake cutthroat	
			1984	2,268	252	Kamloops rainbow	
			1985	2,250	250	westslope cutthroat	
			1986	2,500	278	westslope cutthroat	
			1987	2,250	250	westslope cutthroat	

Table 1. Continued.

Drainage	Lake	Surface acres	Year stocked	Number stocked	Stocking rate (fish/acre)	Stock of fish	Comments
<u>Kootenai</u>	Spruce (1-147)	5	1977	6,292	1,258	Henrys Lake cutthroat	
			1978	5,136	1,027	Henrys Lake cutthroat	
			1980	2,509	502	westslope cutthroat	
			1982	2,432	486	Kamloops rainbow	
			1983	1,297	259	Henrys Lake cutthroat	
			1984	2,520	504	Kamloops rainbow	
			1985	1,250	250	westslope cutthroat	
			1986	1,250	250	westslope cutthroat	
			1987	1,250	250	westslope cutthroat	
	Queen (1-148)	5	1978	3,184	637	Henrys Lake cutthroat	
			1980	1,770	354	westslope cutthroat	
			1983	1,296	259	Henrys Lake cutthroat	
			1986	1,250	250	westslope cutthroat	
	Debt (1-150)	5	1985	1,250	250	westslope cutthroat	
	Copper (1-154)	5	1978	2,016	403	Henrys Lake cutthroat	
			1980	2,091	418	westslope cutthroat	
			1983	1,297	259	Henrys Lake cutthroat -	
			1984	1,390	278	westslope cutthroat	
			1986	1,250	250	westslope cutthroat	
	Callahan (Smith) (1-166)	10	1978	2,688	269	Henrys Lake cutthroat	
			1979	3,636	364	Henrys Lake cutthroat	
			1984	2,500	250	westslope cutthroat	
			1987	2,522	252	westslope cutthroat	
<u>Pend Oreille</u>	Hunt (2-101)	12	1977	4,000	333	Golden trout	
			1979	3,180	265	Kamloops rainbow	
			1982	3,648	304	Kamloops rainbow	
			1985	3,000	250	westslope cutthroat	
			1986	3,000	250	westslope cutthroat	
			1987	3,033	253	westslope cutthroat	

Table 1. Continued.

Drainage	Surface Lake	acres	Year stocked	Number stocked	Stocking rate (fish/acre)	Stock of fish	Comments
<u>Pend Oreille</u>	Standard (2-103)	16	1978	7,074	442	Henrys Lake cutthroat	
			1980	5,472	342	westslope cutthroat	
			1983	4,021	251	Henrys Lake cutthroat	
			1985	4,000	250	westslope cutthroat	
			1987	3,962	248	westslope cutthroat	
	Two Mouth #1 (2-106)	?	1979	2,456		Henrys Lake cutthroat	Discontinue stocking due to winterkill
			1981	2,258		westslope cutthroat	
	Two Mouth #2 (2-107)	5	1979	2,456	491	Henrys lake cutthroat	
			1981	2,258	452	westslope cutthroat	
			1983	2,054	411	Henrys Lake cutthroat	
			1985	1,265	253	westslope cutthroat	
			1987	1,269	254	westslope cutthroat	
	Two Mouth #3 (2-108)	20	1977	9,444	472	Henrys Lake cutthroat	
			1979	6,140	307	Henrys Lake cutthroat	
			1981	6,774	339	westslope cutthroat	
			1983	4,973	249	Henrys Lake cutthroat	
			1984	5,280	264	westslope cutthroat	
			1986	5,000	250	westslope cutthroat	
	Mollies (2-114)	2	1978	2,016	1,008	Henrys Lake cutthroat	
			1981	3,352	1,672	westslope cutthroat	
			1983	648	324	Henrys Lake cutthroat	
			1985	506	253	westslope cutthroat	
			1987	508	254	westslope cutthroat	
	Caribou (near West Fk. Mtn.) (2-116)	6.8	1980	2,052	302	westslope cutthroat	
			1984	1,752	258	Henrys Lake cutthroat	
			1986	1,750	257	westslope cutthroat	
			1987	1,750	257	westslope cutthroat	

Table 1. Continued.

Drainage	Lake	Surface acres	Year stocked	Number stocked	Stocking rate (fish/acre)	Stock of fish	Comments
Pend Oreille	Fault (Hunt Peak #1) (2-121)	6	1978	2,016	336	Henrys Lake cutthroat	
			1979	3,184	531	Kamloops rainbow	
			1981	2,258	376	westslope cutthroat	
			1983	2,872	478	Henrys Lake cutthroat	
			1985	1,500	250	westslope cutthroat	
			1987	1,500	250	westslope cutthroat	
	McCormick (Hunt Peak #2) (2-122)	3.1	1977	2,544	832	Henrys Lake cutthroat	
			1979	1,592	513	Kamloops rainbow	
			1981	2,258	728	westslope cutthroat	
			1985	780	252	westslope cutthroat	
			1987	775	250	westslope cutthroat	
	Little Harrison (2-126)	6.5	1977	3,148	484	Henrys Lake cutthroat	
			1979	2,424	373	Henrys Lake cutthroat	
			1981	2,258	347	westslope cutthroat	
			1983	1,651	254	Henrys Lake cutthroat	
			1987	1,625	250	westslope cutthroat	
	Beehive (2-128)	7	1977	3,148	450	Henrys Lake cutthroat	
			1979	2,424	346	Henrys Lake cutthroat	
			1981	2,258	323	westslope cutthroat	
			1983	1,723	246	Henrys Lake cutthroat	
			1985	1,740	248	westslope cutthroat	
			1986	1,803	258	westslope cutthroat	
			1987	1,750	250	westslope cutthroat	
	Harrison (2-129)	29	1978	10,272	354	Henrys Lake cutthroat	
			1979	3,184	110	Kamloops rainbow	
			1981	9,218	318	westslope cutthroat	
			1982	6,972	240	Kamloops rainbow	
			1983	7,243	250	Henrys Lake cutthroat	
			1984	7,296	250	Kamloops rainbow	
			1985	7,200	248	westslope cutthroat	
			1986	6,870	237	westslope cutthroat	
			1987	7,264	250	westslope cutthroat	

Table 1. Continued.

Drainage	Lake	Surface acres	Year stocked	Number stocked	Stocking rate (fish/acre)	Stock of fish	Comments
Pend Oreille	Beaver (2-130)	5	1977	3,840	770	Brook trout	Natural reproduction
			1980	1,936	387	Brook trout	
	Dennick (2-171)	8	1977	3,144	393	Henrys Lake cutthroat	
			1978	2,568	321	Henrys Lake cutthroat	
			1980	2,509	314	westslope cutthroat	
			1981	5,800	725	westslope cutthroat	
			1983	1,939	242	Henrys Lake cutthroat	
			1984	2,060	258	westslope cutthroat	
			1985	2,010	251	westslope cutthroat	
			1986	2,500	312	westslope cutthroat	
			1987	2,000	250	westslope cutthroat	
	Sand (2-172)	5	1977	2,096	419	Henrys Lake cutthroat	
			1978	3,184	637	Henrys Lake cutthroat	
			1980	2,509	502	westslope cutthroat	
			1981	3,480	696	westslope cutthroat	
			1982	8,360	1,672	Kokanee	
			1983	1,221	244	Henrys Lake cutthroat	
			1984	1,254	251	westslope cutthroat	
			1985	1,260	252	westslope cutthroat	
			1986	1,250	250	westslope cutthroat	
			1987	1,250	250	westslope cutthroat	
	Bloom (2-173)	20	1977	7,852	392	Brook trout	
			1978	10,304	515	Brook trout	
			1979	13,680	684	westslope cutthroat	
			1981	24,402	1,220	Brook trout	
			1982	10,620	531	Brook trout	
			1984	5,041	252	Brook trout	
			1985	4,599	230	Brook trout	
			1986	5,360	268	Brook trout	
			1987	5,000	250	Brook trout	

Table 1. Continued.

Drainage	Lake	Surface acres	Year stocked	Number stocked	Stocking rate (fish/acre)	Stock of fish	Comments
Pend Oreille	Porcupine (2-182)	13	1977	1,040	80	Catchable rainbow	
			1978	2,000	154	Catchable rainbow	
			1979	4,200	323	Catchable rainbow	
			1979	4,560	351	Kamloops rainbow	
			1980	4,440	342	Catchable rainbow	
			1982	1,296	100	Kamloops rainbow	
			1983	2,872	220	Domestic Kamloops (Size 2)	
			1984	1,016	78	Catchable rainbow	
			1985	1,000	77	Catchable rainbow	
			1986	1,075	83	Mt. Lassen rainbow (Size 3)	
			1987	--	--	--	Road washed out
	Moose (2-185)	?	1987	1,000		Brown trout	Test control on stunted brook trout
	Antelope (2-190)	16	1977	4,000	250	Catchable rainbow	Access problems, stocking discon't
			1977	5,924	370	Henrys Lake cutthroat	
			1978	2,890	181	Catchable rainbow	
			1979	6,459	404	Catchable rainbow	
			1979	4,484	280	Kamloops rainbow	
			1980	4,970	311	Catchable rainbow	
			1981	5,000	312	Westslope cutthroat	
			1982	5,032	314	Westslope cutthroat	
	Caribou (near Keokee Mtn.) (2-196)	6.8	1977	3,148	463	Henrys Lake cutthroat	
			1978	2,568	378	Henrys Lake cutthroat	
			1983	2,872	422	Henrys Lake cutthroat	
			1984	1,750	257	Westslope cutthroat	
			1985	1,700	250	Westslope cutthroat	
			1986	1,500	220	Westslope cutthroat	
			1987	1,704	250	Westslope cutthroat	

Table 1. Continued.

Drainage	Lake	Surface acres	Year stocked	Number stocked	Stocking rate (fish/acre)	Stock of fish	Comments
Spokane	Mirror (3-117)	5	1979	5,195	1,039	Henrys Lake cutthroat	winter kill lake, evaluate before further stocking.
			1981	5,000	1,000	westslope cutthroat	
	Elsie (3-119)	10	1977	1,505	151	Catchable rainbow	Stock catchable rainbow annually, other fish were show pond (SP) fish from Mullan Hatchery.
			1978	2,020	202	Catchable rainbow	
			1979	1,665	166	Catchable rainbow	
			1979	21	--	Dolly Varden (SP)	
			1980	3,190	319	Catchable rainbow	
			1981	3,875	388	Catchable rainbow	
			1981	49	--	Rainbow (SP)	
			1981	48	--	Cutthroat (SP)	
			1981	53	--	Brook trout (SP)	
			1981	14	--	Kokanee (SP)	
			1981	1	--	Dolly Varden (SP)	
			1982	1,440	144	Catchable rainbow	
			1983	1,500	150	Catchable rainbow	
			1984	2,865	286	Catchable rainbow	
			1985	3,005	300	Catchable rainbow	
			1986	3,024	302	Catchable rainbow	
			1987	2,000	200	Hayspur rainbow (Size 3)	
	Lower Glidden (3-123)	12	1977	1,680	140	Catchable rainbow	
			1978	2,486	207	Catchable rainbow	
			1979	4,240	353	Catchable rainbow	
			1980	2,030	169	Catchable rainbow	
			1981	1,950	162	Catchable rainbow	
			1982	1,880	157	Catchable rainbow	
			1983	1,000	83	Catchable rainbow	
			1984	4,945	412	Catchable rainbow	
			1985	3,018	251	Catchable rainbow	
			1986	3,011	251	Catchable rainbow	
			1987	3,277	273	Hayspur rainbow (Size 3)	

Table 1. Continued.

Drainage	Lake	Surface acres	Year stocked	Number stocked	Stocking rate (fish/acre)		
						Stock of fish	Comments
Spokane	Upper Glidden (3-124)	10	1978	2,000	200	Kamloops rainbow	Evaluate Kamloops control of stunted brook trout.
			1980	992	99	Kamloops rainbow	
	Gold (3-125)	3	1978	500	167	Kamloops rainbow	
			1979	384	128	Brook trout	
			1981	1,000	333	westslope cutthroat	
			1983	1,005	335	Henrys Lake cutthroat	
			1987	750	250	westslope cutthroat	
	Revett	12	1980	992	83	Kamloops rainbow	Evaluate Kamloops control of stunted brook trout.
	Crater (3-133)	5	1979	5,000	1,000	Grayling	Reserve for grayling.
			1983	5,000	1,000	Grayling	
			1987	2,100	420	Grayling	
	Dismal (3-138)	?	1979	2,670	--	Catchable rainbow	Reduce stocking to 250 fish and evaluate.
			1980	870	--	Catchable rainbow	
			1983	1,500	--	Catchable rainbow	
			1984	537	--	Catchable rainbow	
			1985	490	--	Catchable rainbow	
			1986	253	--	Catchable rainbow	
			1987	249	--	Hayspure rainbow (size 3)	
	Bacon (3-144)	9	1979	4,156	462	Henrys Lake cutthroat	
			1981	4,000	444	westslope cutthroat	
			1985	2,255	250	westslope cutthroat	
			1987	2,250	250	westslope cutthroat	
	Forage (3-146)	13	1977	4,000	308	Golden trout	Reserve for goldens or grayling.
			1979	3,330	256	Golden trout	
			1987	3,150	242	Golden trout	

Table 1. Continued.

Drainage	Lake	Surface acres	Year stocked	Number stocked	Stocking rate (fish/acre)	Stock of fish	Comments
13	<u>Spokane</u>	12	1979	5,195	433	Henrys Lake cutthroat	
			1981	5,000	417	Westslope cutthroat	
			1985	3,010	251	Westslope cutthroat	
			1987	3,000	250	Westslope cutthroat	
		10	1978	4,830	483	Henrys Lake cutthroat	
			1979	4,848	485	Henrys Lake cutthroat	
			1981	9,988	999	Westslope cutthroat	
			1983	4,380	438	Henrys Lake cutthroat	
			1985	2,510	251	Westslope cutthroat	
			1987	2,510	251	Westslope cutthroat	
	<u>Little North Fork Clearwater</u>	4	1981	3,014	753	Westslope cutthroat	
			1986	1,000	250	Westslope cutthroat	
		?	1986	1,500		Westslope cutthroat	
		12	1979	3,117	260	Henrys Lake cutthroat	
			1981	3,014	251	Westslope cutthroat	
			1986	3,000	250	Westslope cutthroat	
		6	1979	3,117	520	Henrys Lake cutthroat	
			1981	3,014	502	Westslope cutthroat	
			1987	1,500	250	Westslope cutthroat	
		4	1979	3,117	779	Henrys Lake cutthroat	
			1981	3,014	753	Westslope cutthroat	
			1986	1,000	250	Westslope cutthroat	
		40	1979	3,117	78	Henrys Lake cutthroat	
			1981	3,014	75	Westslope cutthroat	
			1986	10,000	250	Westslope cutthroat	

Table 1. Continued.

Drainage	Lake	Surface acres	Year stocked	Number stocked	Stocking rate (fish/acre)	Stock of fish	Comments
Little North Fork Clearwater	Northbound (6-123)	12	1979	3,117	260	Henrys Lake cutthroat	
			1981	3,014	251	westslope cutthroat	
			1986	3,000	250	westslope cutthroat	
	Sky land (6-125)	13	1979	3,117	240	Henrys Lake cutthroat	
			1981	3,014	232	westslope cutthroat	
			1987	3,250	250	westslope cutthroat	
	Fawn (6-126)	13	1979	3,117	240	Henrys Lake cutthroat	
			1981	3,014	232	westslope cutthroat	
			1986	3,250	250	westslope cutthroat	
	No-Seeum (6-130)	4	1977	1,500	375	Henrys Lake cutthroat	
			1978	1,900	475	Henrys Lake cutthroat	
			1981	1,174	294	Rainbow/cutthroat hyb.	
			1985	1,008	251	westslope cutthroat	
			1987	1,000	250	westslope cutthroat	
	Steamboat (6-131)	9	1979	4,000	444	Grayling	Reserve for grayling.
			1981	1,174	130	Rainbow/cutthroat hyb.	
			1986	2,000	222	Grayling	
	Copper (6-201)	3	1978	1,000	333	Henrys Lake cutthroat	
			1981	1,000	333	westslope cutthroat	
			1981	1,000	333	Rainbow/cutthroat hyb.	
			1985	765	255	westslope cutthroat	
	Gold (6-202)	8	1986	2,000	667	westslope cutthroat	
	Tin (6-204)	3	1987	750	250	westslope cutthroat	

Table 1. Continued.

Drainage	Lake	Surface acres	Year stocked	Number stocked	Stocking rate (fish/acre)	Stock of fish	Comments
<u>Little North Fork Clearwater</u>	Silver (6-205)	10	1978	2,000	200	Rainbow	
			1981	2,00	200	westslope cutthroat	
			1981	888	89	Rainbow	
			1985	999	100	Mt. Lassen rainbow	

Domestic Kamloops rainbow fry were scheduled for seven lakes in 1987, but fry of the proper size were not available. Westslope cutthroat were substituted in West Fork, Trout, Pyramid, Gold, Mud, and Skyland lakes. Brown trout fry were stocked in Estelle to control stunted brook trout. Three of four lakes scheduled for grayling were stocked in 1987 (Steamboat was missed), and Forage Lake received golden trout. Stocking histories for all mountain lakes in Region 1 are summarized in Table 1 for the period 1977 to 1987.

No creel census data was available for 1987.

The stocking schedule for Region 1 mountain lakes attempts to balance the number of each species of fish and the number of lakes to be stocked each year (Tables 2 and 3). Deviations from the schedule have most often been caused by lack of fish, lack of proper-sized fish (too large at stocking time), or conflicts with other hatchery programs. Lakes in the Little North Fork Clearwater drainage were stocked by plane from the McCall Hatchery in 1987.

Species diversity in most lakes will be maintained by utilizing westslope cutthroat and domestic Kamloops rainbow. Golden and grayling will be used for specialty lakes and brown trout for attempted control of stunted brook trout. Do not stock rainbow in mountain lakes in the Pend Oreille drainage to avoid diluting the wild Gerrard rainbow gene pool, and only stock westslope cutthroat in lakes specified for cutthroat.

Table 2. Odd year stocking schedule for Region 1 mountain lakes.

Lake	Code no.	Surface acres	No. stocked	Species	Substitute species
<u>Kootenai</u>					
Hidden	01-103	50	12,500	C2	K1
Lake Mtn.	01-104	7	1,750	C2	None
West Fork	01-109	12	3,000	K1	C2
Long Mtn.	01-112	3	1,500	GR	None
Parker	01-113	3	1,000	GN	GR
Smith	01-115	6	3,000	GR	None
Big Fisher	01-117	10	2,500	C2	None
Myrtle	01-122	20	5,000	C2	None
Trout	01-124	7	1,750	K1	C2
Pyramid	01-125	11	2,750	K1	C2
Snow	01-134	10	2,500	C2	None
Roman Nose #3	01-137	12	3,000	K1	C2
Solomon	01-146	9	2,250	C2	K1
Spruce	01-147	5	1,250	K1	C2
Debt	01-150	5	1,250	C2	None
<u>Pend Oreille</u>					
Hunt	02-101	12	3,000	C2	None
Standard	02-103	16	4,000	C2	None
Two Mouth #2	02-107	5	1,250	C2	None
Mollies	02-114	2	500	C2	None
Fault	02-121	6	1,500	C2	None
McCormick	02-122	3.1	775	C2	None
Beehive	02-128	7	1,750	C2	None
Harrison	02-129	29	7,250	C2	None
Dennick	02-171	8	2,000	C2	None
Sand	02-172	5	1,250	C2	None
Bloom	02-173	20	5,000*	BK*Size 2	None
Caribou	02-196	6.8	1,700	C2	None
(near Keokee Mtn.)					
<u>Spokane</u>					
Gold	03-125	3	750	K1	None
Crater	03-133	5	2,500	GR	None
Bacon	03-144	9	2,250	C2	GR
Forage	03-146	13	3,250	GN	None
Halo	03-147	12	3,000	C2	None
Crystal	03-160	10	2,500	C2	None

Table 2. Continued.

Lake	Code no.	Surface acres	No. stocked	Species	Substitute species
<u>Little North Fork Clearwater</u>					
Mud	06-118	6	1,500	K1	None
Skyland	06-125	13	3,250	K1	None
No Seeum	06-130	4	1,000	C2	None
Steamboat	06-131	9	4,500	GR	None
Copper	06-201	3	750	C2	None
Silver	06-205	10	2,500	K1	None
Total number of fish to be stocked:					
C2 - 62,225					
K1 - 19,750					
GR - 11,500					
GN - 4,250 (Grayling can be substituted for goldens.)					
BK - 5,000 Size 2					

Table 3. Even year stocking schedule for Region 1 mountain lakes.

Lake	Code no.	Surface acres	No. stocked	Species	Substitute species
<u>Kootenai</u>					
Hidden	01-103	50	12,500	K1	C2
West Fork	01-109	12	3,000	C2	K1
Long Mtn.	01-112	3	1,500	GR	None
Parker	01-113	3	1,000	GN	GR
Smith	01-115	6	3,000	GR	None
Trout	01-124	7	1,750	C2	K1
Pyramid	01-125	11	2,750	C2	K1
Ball Creek	01-126	6	1,500	C2	None
Little Ball Cr.	01-127	4	1,000	C2	None
Roman Nose #3	01-137	12	3,000	C2	K1
Solomon	01-146	9	2,250	C2	K1
Spruce	01-147	5	1,250	C2	K1
Queen	01-148	5	1,250	C2	None
Copper	01-154	5	1,250	C2	None
Callahan	01-166	10	2,500	C2	None
Estelle	01-167	5	1,250	BN	None
<u>Pend Oreille</u>					
Hunt	02-101	12	3,000	C2	None
Two Mouth #3	02-108	20	5,000	C2	None
Caribou	02-116	6.8	1,750	C2	None
(near West Fk. Mtn.)					
Little Harrison	02-126	6.5	1,625	C2	None
Harrison	02-129	29	7,250	C2	None
Beaver	02-130	5	1,250	BN	None
Dennick	02-171	8	2,000	C2	None
Sand	02-172	5	1,250	C2	None
Bloom	02-173	20	5,000*	BK *Size 2	None
Moose	02-185	16.5	4,200	BN	None
Caribou	02-196	6.8	1,700	C2	None
(near Keokee Mtn.)					
<u>Spokane</u>					
Crater	03-133	5	2,500	GR	None
Forage	03-146	13	3,250	GN	GR

Table 3. Continued.

Lake	Code no.	Surface acres	No. stocked	Species	Substitute species
<u>Little North Fork Clearwater</u>					
Devils Club	06-113	4	1,000	C2	None
Big Talk	06-114	7	2,500	C2	None
Larkins	06-117	12	3,000	C2	None
Hero	06-119	4	1,000	C2	None
Heart	06-122	40	10,000	K1	None
Northbound	06-123	12	3,000	C2	None
Fawn	06-126	13	3,250	C2	None
Steamboat	06-131	9	4,500	GR	None
Gold	06-202	8	2,000	C2	None
Tin	06-204	3	750	K1	None
Total number of fish to be stocked:					
C2 - 60,825					
K1 - 23,250					
GR - 11,500					
GN - 4,250 (Grayling can be substituted for goldens.)					
BK - 5,000 Size 2					
BN - 6,700					

JOB PERFORMANCE REPORT

State of: Idaho

Name: REGIONAL FISHERY MANAGEMENT
INVESTIGATIONS

Project No.: F-71-R-12

Title: Region 1 Lowland Lakes
Investigations

Job No.: 1-b

Period Covered: July 1, 1987 to June 30, 1988

ABSTRACT

Priest Lake research on cutthroat, kokanee, and lake trout was completed in 1987. Kokanee abundance could not be estimated on Priest in 1987 because trawl catch was too low. High predation by lake trout is still limiting kokanee enhancement programs. Modeling of lake trout suggests that exploitation would have to increase dramatically to affect the population's predatory pressure and that excessively restrictive regulations would be required to enhance the quality of the lake trout fishery.

Restrictive regulations for enhancement of trophy Gerrard rainbow in Pend Oreille Lake were developed in 1987. The good kokanee egg take in 1987 will ensure a comprehensive release evaluation on Pend Oreille in 1988. Kokanee abundance increased beyond 6 million fish in Pend Oreille Lake, and the enhancement program appears to be on track.

Angling effort and harvest were again evaluated on the northern and southern ends of Lake Coeur d'Alene. Anglers fished an estimated 228,000 hours on the lake to catch 212,000 kokanee and 350 chinook salmon.

Nearly 60,000 fall chinook postsmolts were released in Wolf Lodge Bay of Lake Coeur d'Alene in July 1987. Mean size of fish released was 119 mm. Estimated kokanee abundance in Coeur d'Alene exceeded 13 million fish. Kokanee fry made up 50% of the sample, probably due to earlier than normal trawling.

Kokanee abundance in Spirit Lake was estimated at 670,000 fish in 1987. Recruitment was subsequently bolstered by a release of 60,000 hatchery fry.

The conservation officer creel census was continued in 1987 to provide information on effort and harvest throughout the region. Evaluation of catchable trout was also continued in conjunction with the census.

Domestic Kamloops and Mt. Shasta rainbow were stocked in Hayden Lake in 1987. Status of smallmouth bass was re-evaluated, especially with respect to the new 14-inch minimum size limit adopted for bass on the lake in 1988.

Physical characteristics of four lakes were conducted in 1987, and fish populations were evaluated on seven systems. Additionally, three lakes are scheduled for rehabilitation during the fall of 1988 and appropriate calculations and plans were made.

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OBJECTIVES

1. To obtain biological and limnological data on selected lowland lakes in Region 1.
2. To provide baseline information for species and stock modeling and management programs.
3. To assess performance and contribution of existing trout stocks.
4. To evaluate success of kokanee rehabilitation projects on Region 1 lakes and evaluate introductions of new species.

To describe patterns of angling effort and success in evaluating management programs.

RECOMMENDATIONS

1. Replace opening day creel census on Hauser, Jewell, Kelso, Mirror, Spirit, and Lower Twin lakes with a trend information program to be conducted on Free Fishing Day. Data collected should include effort, catch, and catch rates.
2. Maintain stocking rates of 300 and 50 catchable rainbow/hectare for lakes <50 hectares and >50 hectares in surface area, respectively.
3. Conduct officer creel census in 1987 on Pend Oreille, Priest, Hayden, and Coeur d'Alene lakes to evaluate compliance with new regulations and angler attitudes.
4. Collect length frequency data on tournament-caught bass to provide trend information on specific populations.
5. Work with bass clubs to identify and minimize any negative impacts of tournament activities on certain bass populations.
6. Evaluate the suitability of the 12-inch minimum size for largemouth bass in Robinson, Perkins, Dawson, and other lakes where growth is potentially limiting.
7. Continue to monitor survival, growth rates, food habits, spawning success, and appropriateness of the 14-inch minimum size on smallmouth bass released in Hayden Lake.
8. Increase releases of kokanee (100 to 200 hectare) in Brush, Cocolalla, Fernan, Hauser, Jewel, Kelso, Mirror, and Smith lakes to determine if they provide anglers with greater catches of relatively large fish. Releases of kokanee at 500/hectare in Lower Twin Lake should be made to continue the popular fishery that has developed there.

9. Continue annual kokanee monitoring (trawling), especially on Coeur d'Alene and Spirit lakes.
10. Release kokanee fry in Granite Creek of Lake Pend Oreille at or above 3 million annually to ensure adequate egg supplies in the future.
11. Evaluate size and time of release of hatchery-reared Gerrard rainbow stocked in Spring Creek to determine the feasibility of broodstock enhancement efforts at the Clark Fork Hatchery.
12. Differentially mark and imprint with morpholine pure strain Gerrard rainbow fingerlings to be released from the Cabinet Gorge Hatchery ladder to maximize return. Obtain angler support for the pure strain broodstock program through education rather than regulation.
13. Initiate an informational and educational program for anglers on Lake Pend Oreille to teach kokanee/rainbow identification and to give a better understanding of the fishery. Assess angler attitudes about the new regulations.
14. Release 35,000-60,000 fall chinook salmon in Lake Coeur d'Alene by early July at a mean size exceeding 140 mm. Determine potential wild smolt production from Wolf Lodge Creek and potential for spawning adults in the Coeur d'Alene and St. Joe rivers.
15. Restrict spawning fall chinook in Wolf Lodge Creek to the stream below Wolf Lodge Campground with a block weir to prevent competition between juvenile chinook and young cutthroat. All future chinook releases should be marked to determine the contribution of wild fish to the population.
16. Plan and conduct lake reclamation programs on Bonner, Jewell, and Sinclair lakes.

TECHNIQUES AND FINDINGS

Priest Lake

Cutthroat

Research on cutthroat trout in the Priest Lake drainage that began in 1983 was completed in 1987 (Mauser et al. 1988a). Abundance of cutthroat appeared to decline continuously throughout the study period, prompting the adoption of catch-and-release regulations for the 1988-1989 seasons. Population size for cutthroat over 30 cm total length was estimated at 2,336 fish in 1986. Mean size was 294 mm and mean age, 3.7 years. Fifty-five percent were cutthroat of hatchery origin. During the 1986 creel census, total catch and effort were up slightly. but catch rate declined to 0.25 fish/hour. An estimated 1,131 cutthroat were caught: over 88% (1,000) were released. Effort for cutthroat declined threefold in 1987, and only 11 fish were, estimated caught. Complaints of poor fishing were numerous by anglers contacted during the census.

The westslope cutthroat trout broodstock will be upgraded with pure strain fish from Upper Priest Lake beginning in 1988. Catch-and-release regulations were also adopted for cutthroat in Upper Priest to protect this pure broodstock source. Feasibility of collecting spawners near the mouth of and in Trapper Creek will be tested along with the stock's disease status.

Modeling predicted that elimination of the consumptive fishery on cutthroat is necessary to reverse the apparent population decline. Catch-and-release regulations should halt the decline until releases of hatchery fry and fingerlings can be increased. Increased releases of kokanee could also help increase cutthroat escapement by providing an alternate forage for lake trout.

Tributaries downstream from barriers in the Priest Lake system supported mean densities of cutthroat trout under 5/100 m² (Irving 1987). An eightfold increase in cutthroat recruitment to the lake could be achieved by stocking fry at densities of 500-1,000/m² throughout the system. Removal of brook trout from selected tributaries would also significantly increase recruitment (Cowley 1987).

Return of cutthroat to Tango Creek was evaluated in May 1987. A total of 38 cutthroat adults were trapped, giving estimates of survival and return rates for different release groups. Cutthroat released at a 168 mm average size returned at 0.225%, while those released at a mean of 112 mm returned at 0.006% (Mauser 1988b). The paucity of return data limits the strength of inferences that can be drawn from it, but the thirty-sevenfold difference between return rates is impressive.

Kokanee

Too few kokanee were caught during annual trawling to estimate their abundance in Priest Lake (Figure 1). Young-of-the-year kokanee were not collected, which is the first time they have not appeared in trawl catches following late summer release. Four age classes of kokanee were caught during purse seining on Priest Lake in 1987 (Mauser 1988a). Seined kokanee averaged 211 mm in length. Kokanee and mountain whitefish were generally caught together.

Simulation modeling conducted by Mauser (1988a) suggests that annual releases of kokanee in the range of 5-10 million fry will dramatically improve size of lake trout in the catch. The kokanee fishery would be relatively insignificant (1,000-4,000 fish annually) compared to past catches of 100,000 fish annually. Benefits to lake trout growth are negligible beyond kokanee stocking levels of 10 million annually, but harvest of kokanee increase correspondingly. Modeling shows that annual releases of 15 million kokanee fry still only provide a harvest of 11,000+ annually. Re-establishment of the historical kokanee fishery seems unlikely, even at excessive stocking rates.

Annual trawling of Upper Priest Lake yielded an estimate of 16,600 kokanee in at least four age classes (Mauser 1988a). Kokanee appear to persist at stable levels in the Upper Lake where lake trout abundance and

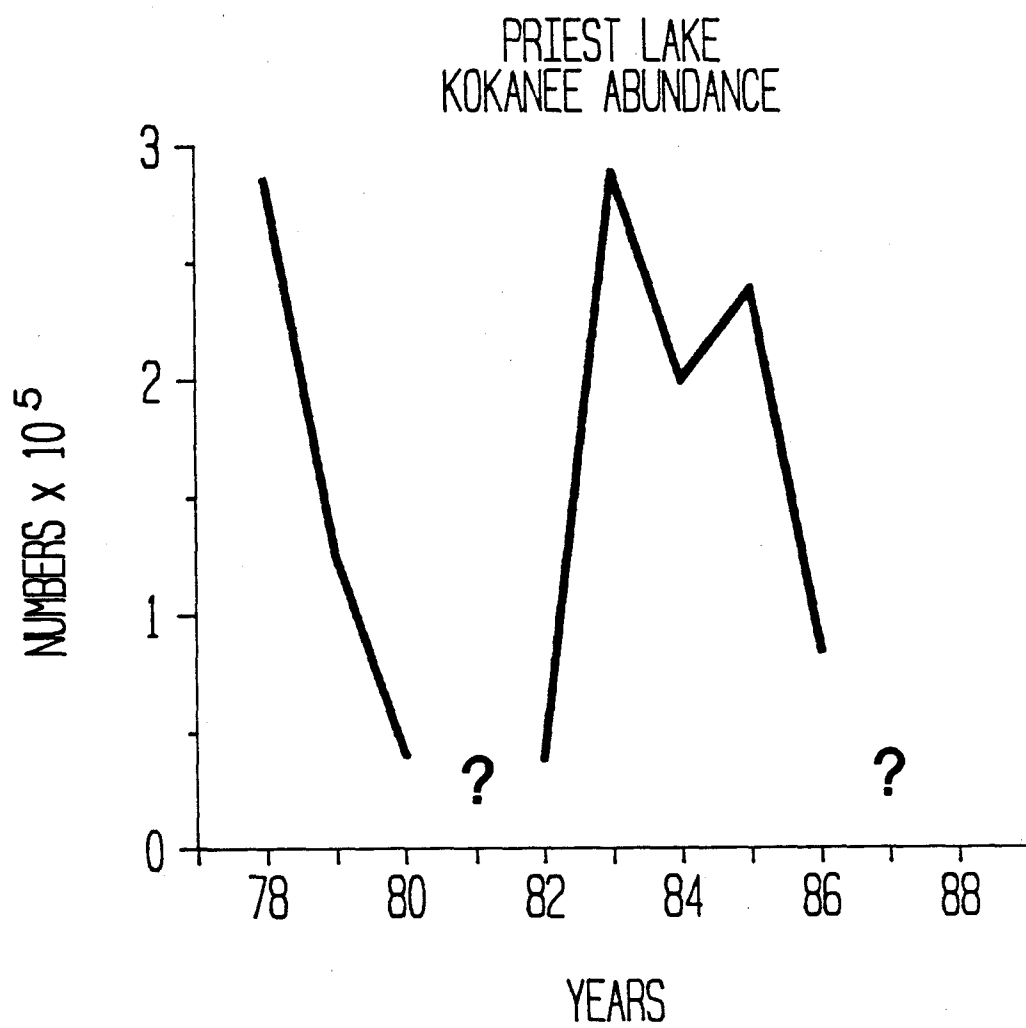


Figure 1. Abundance of kokanee salmon estimated by trawling in Priest Lake, Idaho, 1978-1986.

predation are much less significant. The kokanee population is either supported by wild production or migration from the lower lake as this lake is not stocked.

Lake Trout

Quality lake trout fishing in Priest Lake declined dramatically in 1987 in response to reduced kokanee stocking levels (Mauser 1988a). Mean total length in the creel dropped to 55.7 cm from 61 cm. Mean weight declined from 2.4 kg to 1.6 kg. Lake trout condition had also declined. Mysis were the dominant food item in stomachs of lake trout of all sizes in 1986 and 1987. Only lake trout longer than 51 cm fed on fish. Composition of fish in the diet was divided equally between kokanee (50%) and cutthroat (50%). Minimum exploitation was estimated to be between 23 and 30%.

An extensive modeling effort was conducted in 1987 to identify and quantify relationships among lake trout population dynamics, fishery quality and intensity, and kokanee stocking levels (Mauser 1988a,b). Simulation demonstrated that restrictive regulations were not required to maintain the fishery. The level of exploitation that the fishery could withstand, however, was dependent upon kokanee stocking levels and subsequent kokanee availability. Under high exploitation, decreases in population abundance did not drastically limit recruitment to age classes 6-15, which support the bulk of the fishery. The population and fishery were highly variable at exploitation near 70%, but compensatory mechanisms maintained recruitment.

The effect of several restrictive regulations on providing a higher-quality trophy fishery was modeled by Mauser (1988b). A minimum size of 50 cm did not reduce harvest in the fishery. A 60 cm minimum, while dropping harvest somewhat, still provided no benefits to the population or catch. A 75-cm minimum size, or a 60-75 cm slot was necessary to produce meaningful changes in catch, harvest, and abundance. Under these regulations, lake trout abundance increased with a corresponding rise in kokanee forage requirements. Overall, the excessiveness of restrictions required to improve the trophy component of the lake trout catch are not justifiable and probably not desirable. Regulating kokanee stocking rates appears to have the greatest potential for enhancing lake trout growth, size and condition, and the subsequent angler satisfaction.

Bull Trout

Fishing for bull trout in Priest Lake remained closed in 1987 as spawning escapement continued to be very low. Data from bull trout weir catches and redd counts at Granite Creek indicated that the stream supported a depressed but viable population. The population in the upper lake continues to support a good nonconsumptive fishery, and recruitment appears to be strong and stable (Mauser 1988a). No regulation changes are planned for bull trout in the Priest lakes.

Lake Pend Oreille

Gerrard Rainbow

Historical data on the Gerrard rainbow fishery were gathered from several sources to develop a perspective from which to gauge the quality of the present rainbow fishery. Information from the 1940s until 1960 was incomplete and difficult to locate, but provided enough data to somewhat characterize the fishery. Standardized creel censuses were conducted from 1960 through 1985 and provided excellent data for that period. Documented catches of rainbow over 20 pounds exceeded 240 and 150 fish in 1947 and 1955, respectively (Figure 2). Catches of 20+ pound fish have been variable, but at much lower levels since 1960 than those of the 1940s and 1950s. Reported catches of rainbow between 10 and 20 pounds have been highly variable although no trend is apparent. Documented catches of rainbow between 1 and 10 pounds have increased dramatically since 1970, probably in response to increasing fishing pressure (Figure 3). Catch rates for rainbow over 43.2 cm (17 inch) total length have been highly variable but have generally worsened since 1960 (Figure 4). Mean length of rainbow over 43.2 cm (17 inch) in the catch has also declined.

Pend Oreille's rainbow fishery was characterized by unregulated yield harvest by 1985. Over 77% of the rainbow catch was age IV and younger, and 94.7% was younger than age V (Figure 5). These statistics have greater meaning in light of the fact that mean age of maturity is 5.5 years, and total annual mortality is 61% (Figure 6). Mean length of all rainbow in the sport harvest was 43.2 cm, and mean weight was 1.1 kg (Figure 7). Limited data from outfitters indicate that mean length of their catch and harvest was 51 cm and 61 cm, respectively.

Trout and char anglers comprised 63.5% of total effort (113,968 hours) in 1985, and 87% (99,296 hours) was for trophy rainbow trout. Over 35% (2,150) of all rainbow harvested were taken incidentally by kokanee anglers. Anglers seeking trophy rainbow caught 42% (2,562) of all rainbow (6,100), and the balance (1,388) was taken by anglers seeking rainbow, cutthroat, and bull trout.

A survey of over 4,800 anglers in 1985 revealed that 54% favored more restrictive regulations to improve trophy fishing (mostly trout anglers), while 46% wanted to maintain the liberal regulations. When asked what type of restrictive regulations they would support, 76% favored restrictive length limits, 54% accepted a season bag limit, but only 34% said they would approve of a reduced season length.

The rainbow population was modeled using Ricker's equilibrium-yield algorithm (Ricker 1975) to evaluate the populations' long-term responses to current and more restrictive regulations. The fishery in 1985 was essentially unregulated under the 6-fish bag limit. Over 83% of the anglers who caught fish harvested only one per day. Even a daily bag limit of two rainbow of any size would only reduce annual harvest by 5.5%. Further, the initial modeling demonstrated that the population would be in strong decline by the year 2000 under the 6-fish limit and increasing effort (Figure 8).

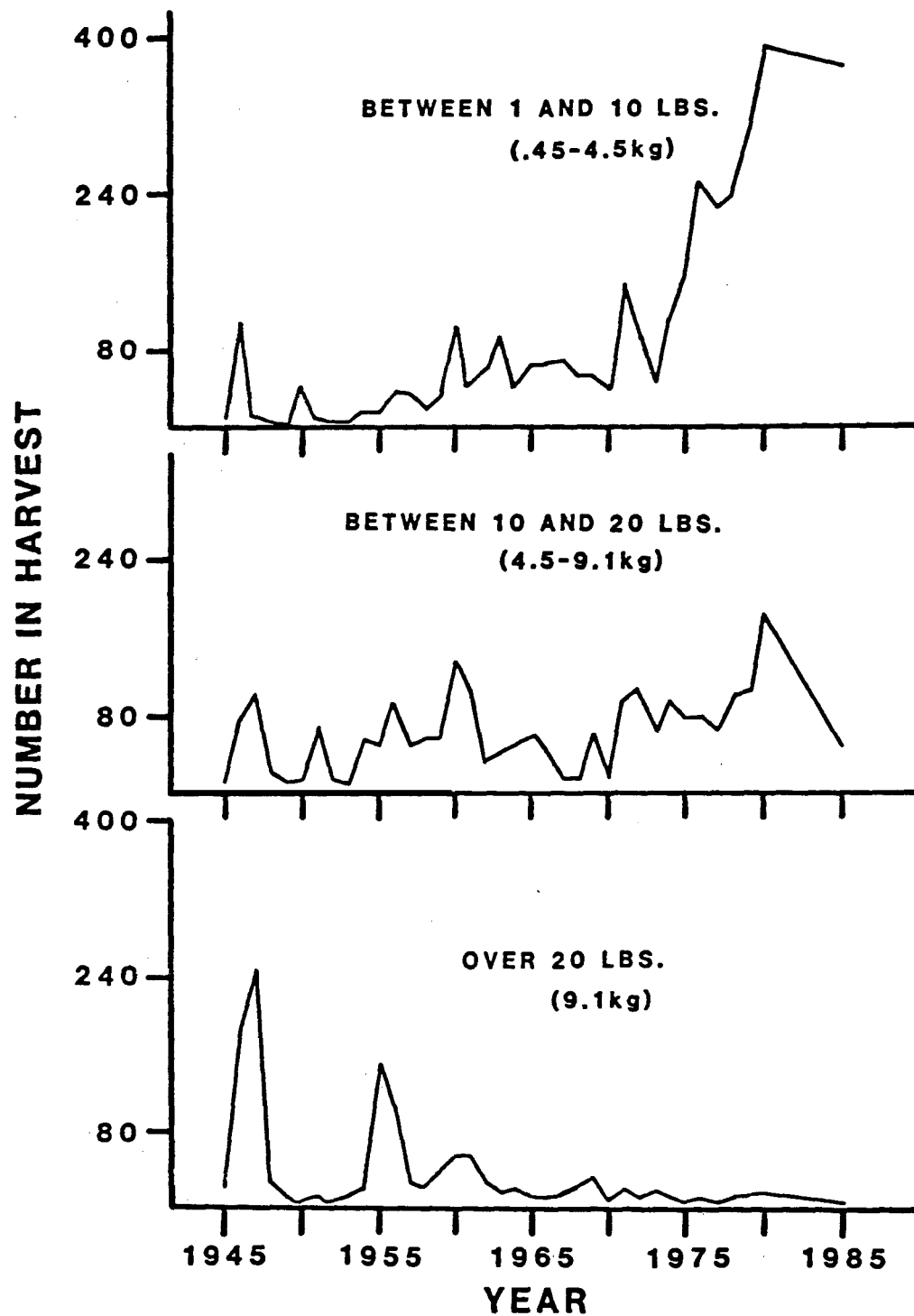


Figure 2. Historic catch statistics for three weight classes of Gerrard rainbow trout from Lake Pend Oreille, Idaho, 1945-1985.

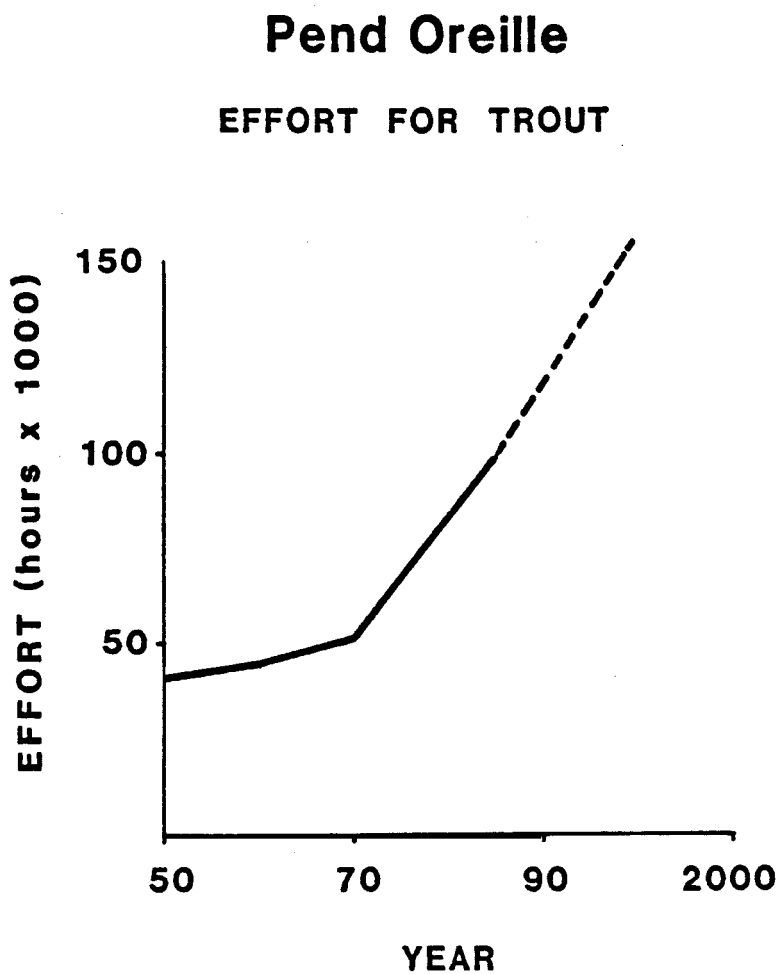


Figure 3. Pattern of fishing effort for trout on Lake Pend Oreille, Idaho, 1950-2000. The dotted line represents predicted effort through 1995.

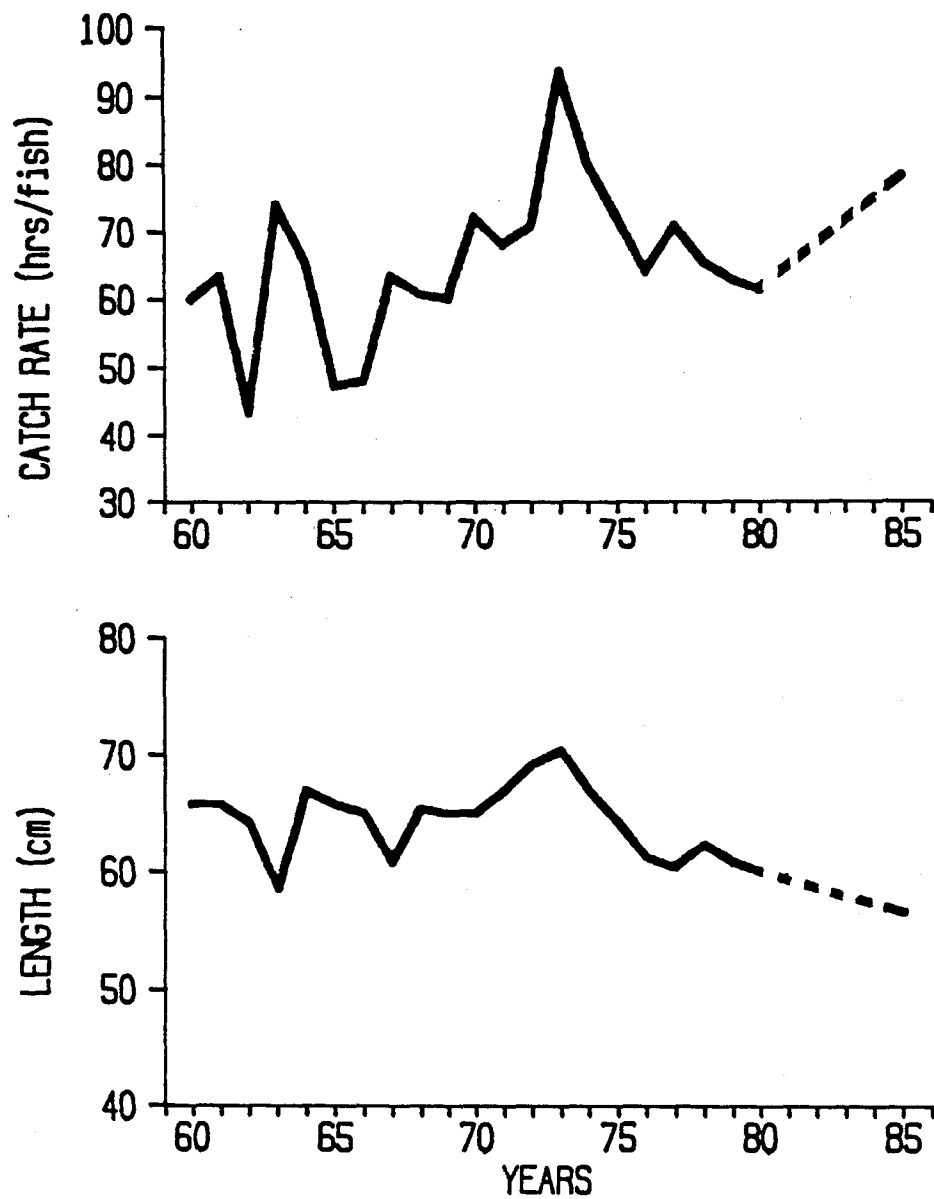


Figure 4. Catch rate and mean length of the catch for Gerrard rainbow trout over 43.2 cm in Lake Pend Oreille, Idaho, 1945-1985.

PEND OREILLE
GERRARD RAINBOW
Harvest by Age - 1985



Figure 5. Harvest of Gerrard rainbow trout by age class in Lake Pend Oreille, Idaho, 1985.

Gerrard Rainbow

CATCH CURVE

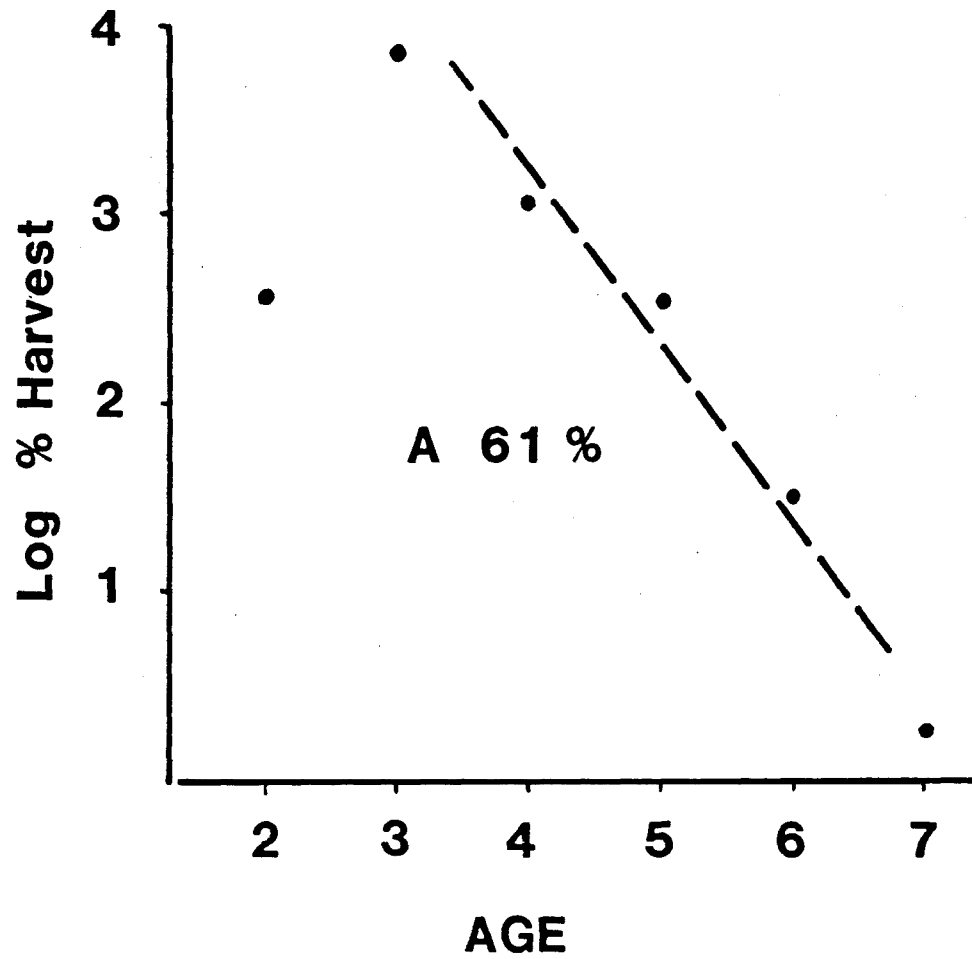


Figure 6. Catch curve and annual mortality estimate (A) for Gerrard rainbow trout, Lake Pend Oreille, Idaho, 1984 and 1985.

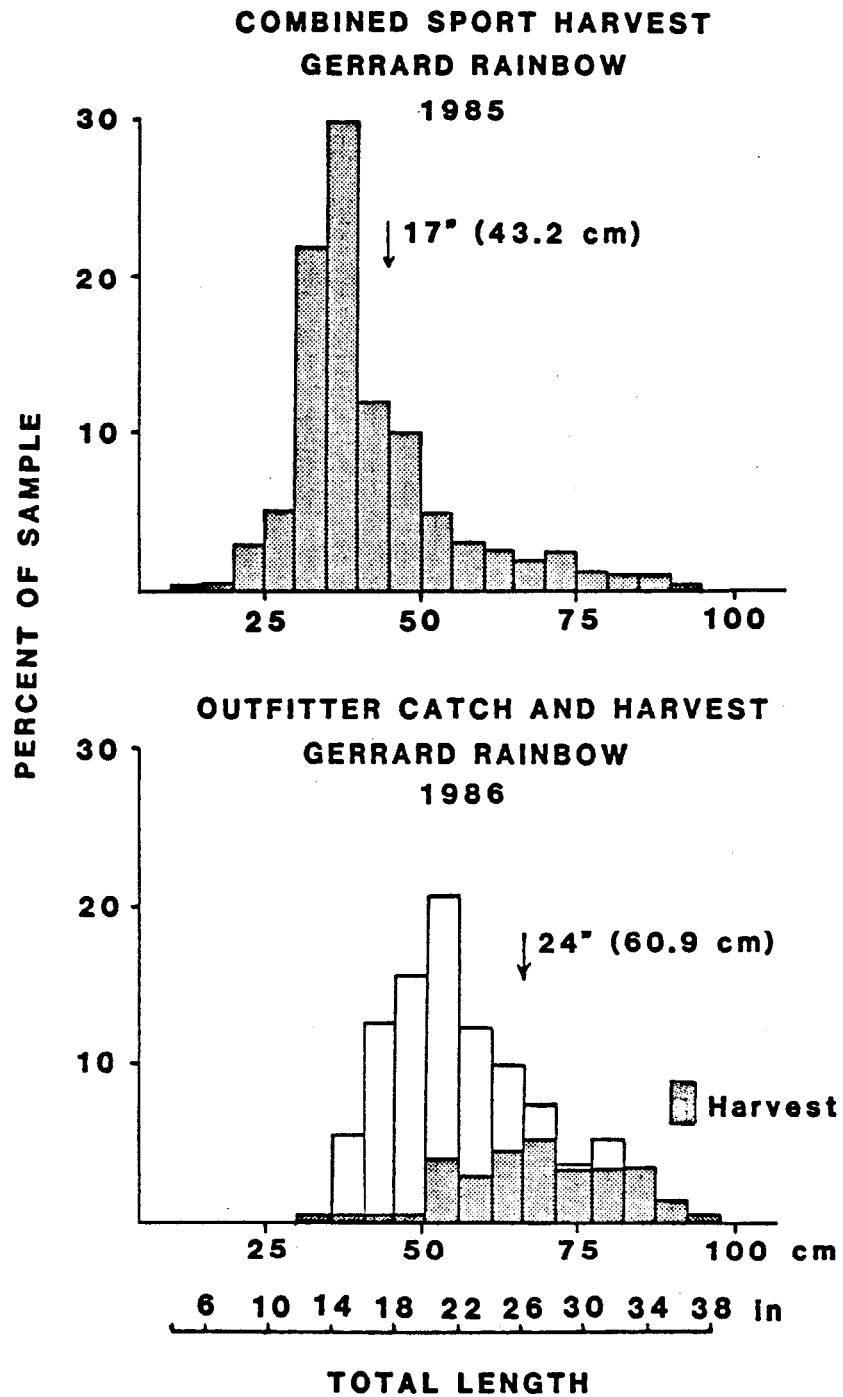


Figure 7. Harvest data for Gerrard rainbow trout from the overall sport harvest (top) and the outfitter catch and harvest (bottom) from Lake Pend Oreille, Idaho, 1985.

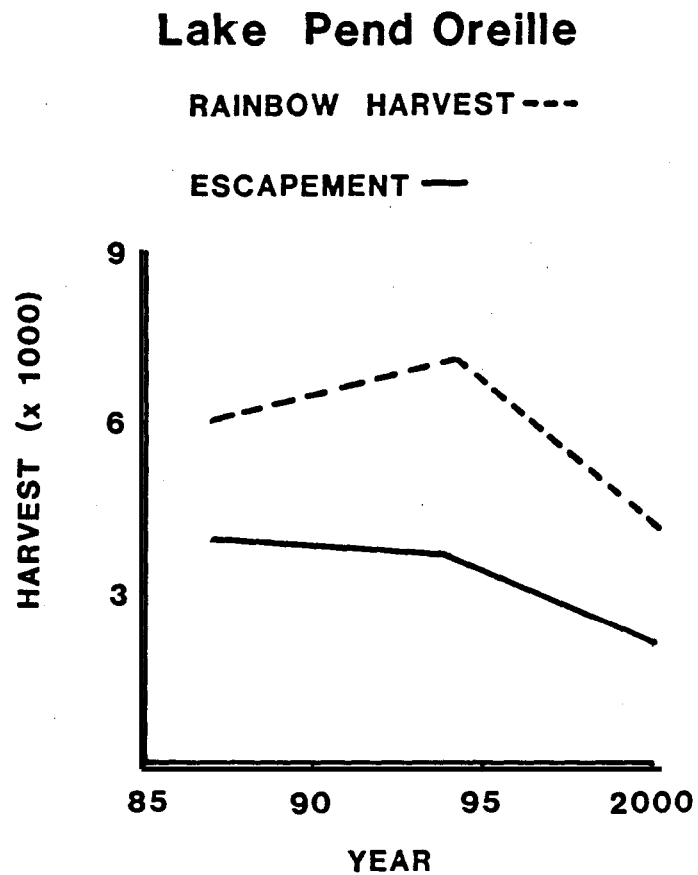


Figure 8. Projected harvest and escapement of Gerrard rainbow trout in Lake Pend Oreille, Idaho, 1985-2000. Escapement has been multiplied by 10, so the pattern is visible on the axes.

Initially, we evaluated how regulations of various minimum sizes would protect segments of current harvest by graphing the cumulative age distribution of the catch (Figure 9). The impact of potential regulations on the rainbow population was then modeled at compliance levels of 50% and 100%. Eight regulations were evaluated and their impact on the fishery was monitored on escapement, harvest, mean weight of individuals in the catch, number of fish over 20 pounds caught annually, and age structure. Performance of five regulations, which represent a gradation of restrictiveness, is given in Table 1.

The 24-inch minimum size obviously made the greatest gains in restoring the rainbow trophy fishery, and it was supported by 64% of respondents at public input meetings held in April 1987. Throughout the regulation development process support for the 24-inch minimum size was strong, although the regulation was controversial because of the level of restrictiveness. A daily bag limit of one rainbow per day, not under 24 inches was recommended to and adopted by the Commission for the 1988-1989 season. The projected performance of this regulation (by 1995) is dramatic compared with the previous 6-fish limit that preceded it (Figure 10).

A major information and education effort will accompany the new rainbow regulation in 1988 and 1989. Emphasis will be placed on giving anglers an understanding of and an appreciation for Gerrard rainbow life history, their unique potential in Pend Oreille, and how to distinguish them from kokanee when small. Rainbow under 14 inches bear a strong resemblance to kokanee with silvery sides and marked countershading. Many kokanee anglers are apparently unable to distinguish these small rainbow from kokanee, which contributes to the high incidental rainbow catch. Those anglers not interested in trophy fishing might be more inclined to support the new regulation if they understand the fish and fishery.

Performance of the regulation will be monitored in future research creel censuses and in spot monitoring during noncensus years. Mean size of rainbow in the catch, number over 20 pounds caught annually, juvenile densities in tributaries (escapement index), total harvest, and angler satisfaction should be adequate indices of regulation performance.

Kokanee

Abundance of kokanee in Lake Pend Oreille increased by 25% in 1987, making it the third highest annual estimate since 1977 (Figure 11). Age 0+ kokanee were more than twice as abundant as in 1986, and ages 2+ and 4+ fish were somewhat more numerous (Bowles 1987). Stronger recruitment of the 1986 year class was due partly to a greater hatchery contribution with increased overall survival (wild and hatchery fry). Even considering the poor survival of fry released into the Clark Fork River in 1987, mean survival among all release groups was elevated due to the larger size of fish at release.

Over 3 million fry were released into the Clark Fork River from Cabinet Gorge Hatchery in 1987. Survival of fry of the river-released groups was considerably less than optimal and will have to be enhanced dramatically to meet fishery goals. One approach to better survival of

Gerrard Rainbow - Age Composition

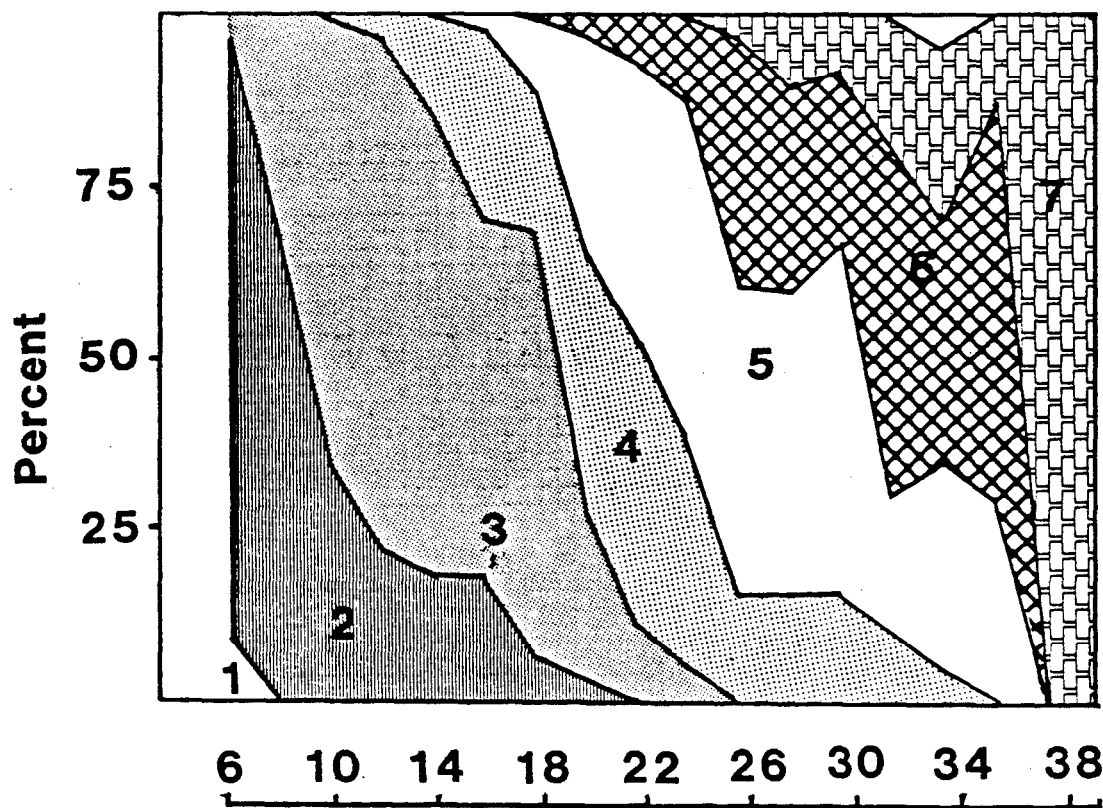


Figure 9. Cumulative catch distribution of Gerrard rainbow trout by size and age on Lake Pend Oreille, Idaho, 1985.

Table 1. A partial list of- regulations modeled and their predicted impact on the Gerrard rainbow fishery in Lake Pend Orielle, Idaho. The influence of angler compliance with regulations is shown on three statistics of the fishery. Target date to achieve these levels is 1995.

Regulation	50% compliance			100% compliance		
		(lb)			(lb)	
	Harvest	Mean weight	# >20 lb	Harvest	Mean weight	# >20 lb
2/day--none between 16" and 20"	6,002	2.7	55	5,907	3.0	67
2/day--none between 16" and 24"	5,804	3.4	80	5,345	4.0	141
2/day--none <16"	5,817	3.5	70	5,400	6.0	105
2/day--none <20"	5,670	4.0	87	4,940	8.0	164
2/day--none <24"	5,401	4.9	123	3,742	11.4	327

Gerrard Rainbow 1986-87 vs Current Regulation

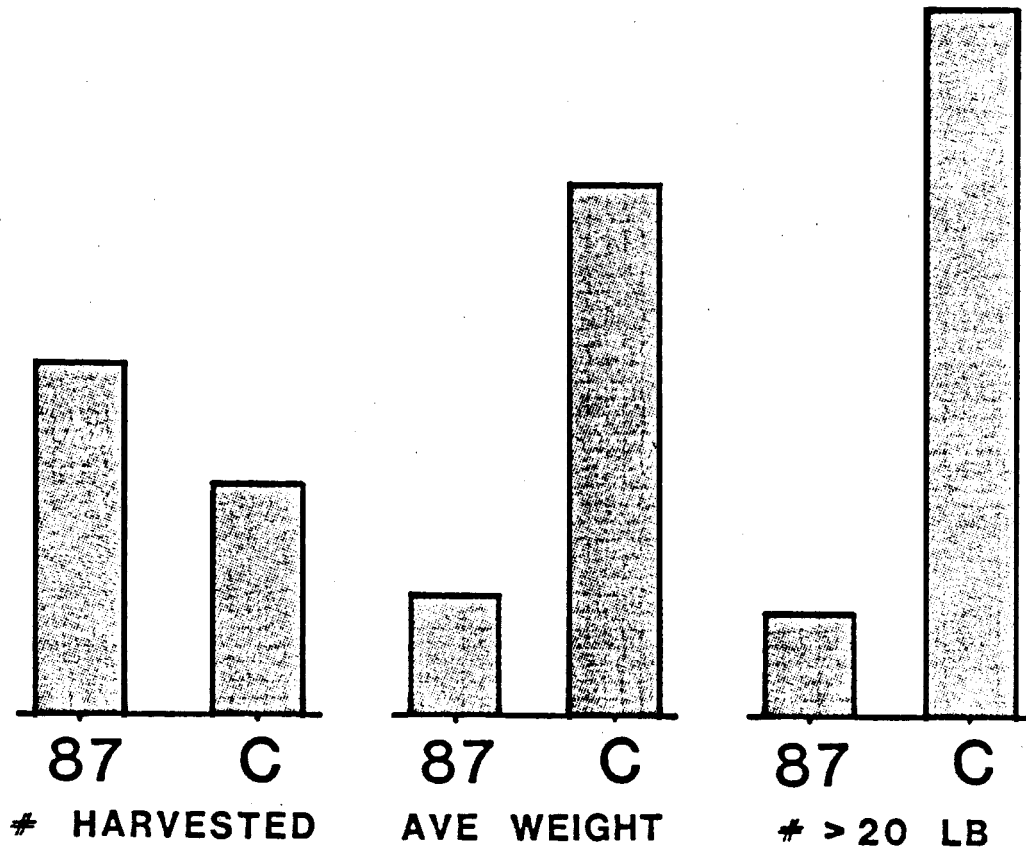


Figure 10. Relative quality of the Gerrard rainbow trout fishery projected under current (C) regulations (1 fish over 24") as compared to that achieved under the 1987 regulation (6 fish).

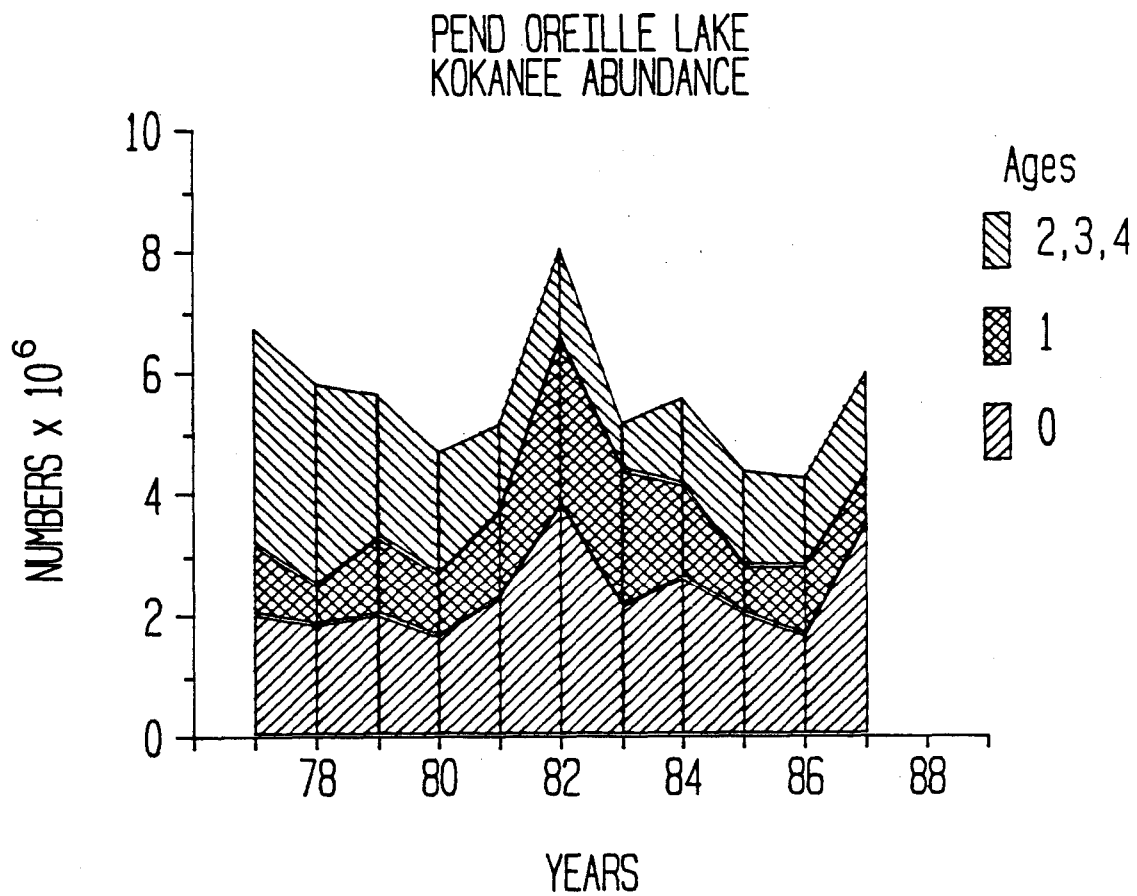


Figure 11. Abundance of kokanee salmon estimated by trawling in Lake Pend Oreille, Idaho, 1976-1987. Selected age groups are represented by differential shading.

fry released in the Clark Fork will be the testing of June releases. Large fry (45 mm) released during peak flows will reach the lake quickly, will be less vulnerable to predators due to high turbidity, and should have adequate visceral fat to survive until more optimal foraging conditions develop in July. This release strategy will be tested in 1988.

Fry from Cabinet Gorge and Clark Fork hatcheries, totaling 2.84 million, were released into Sullivan Springs in 1987. Releases of kokanee fry from Sullivan Springs will be maintained, and techniques to enhance their survival will be evaluated. This important egg source will be maintained to ensure fish for genetic exchange with those of the Clark Fork River run and for other potential egg needs. Total fry releases into Pend Oreille exceeded 5.8 million in 1987.

Totals of 15.4 and 0.6 million kokanee eggs were collected at Sullivan Springs and Cabinet Gorge Hatchery, respectively. Spring Creek was not passable to kokanee spawners in 1987 and no eggs were collected there. Projected release of kokanee fry into Pend Oreille should exceed 13 million in 1988. Primary release sites will be the Clark Fork River, Sullivan Springs, and selected open water areas. The large number of fry available in 1988 will facilitate a comprehensive evaluation of release strategies.

Pend Oreille's kokanee fishery was dramatically improved in 1987 over recent years, but will decline somewhat during 1988-1990 (Bowles 1987). Spawner escapement and potential of the fishery could decrease by 34% and 57%, respectively, by 1989. Both the fishery and escapement levels should increase dramatically by 1991 as successive years of consistent hatchery production move through the kokanee age structure. The outlook for rebuilding the kokanee population on Pend Oreille appears good.

Cutthroat

Harvest of cutthroat trout in the Pend Oreille trawl fishery declined dramatically in the 1960s and has been somewhat stable under 1,000 fish annually for the past 20 years. A cutthroat closure was recommended and adopted for the lake in 1987 to help protect depressed stocks. Public criticism of the regulation became intense in early 1988. Considerable testimony revealed that we may have missed significant cutthroat fisheries along shore and in small bays during the standard creel census. Although the census data may considerably underestimate total annual harvest, it is likely a good index of harvest. Available data on cutthroat were re-evaluated and a one-fish bag limit with a 14-inch minimum size was adopted by the Commission. This regulation would decrease existing annual harvest by 71% and should still allow us to meet program goals.

Bull Trout

Counts of bull trout redds and estimated escapement from tributaries to Lake Pend Oreille increased somewhat in 1987 to 53d and 2,083, respectively. It is still unclear whether escapement dropped dramatically in 1986 to the reported 412 redds, or if the inexperience of the survey crew resulted in low counting efficiency that season. Counts in 1987 were

not consistent with those of previous years (1982-1985), causing concern that the bull trout population in the basin may be declining. Summer drought conditions in 1986 and 1987 resulted in very low fall flow conditions. Excessive bedload sediment deposits in low gradient sections of tributary streams are adding to subsurface flow problems.

A somewhat more restrictive daily bag limit of one per day, any size, was proposed for bull trout on Pend Oreille in 1988. This regulation was designed to ensure that bull trout hold their own in face of future increases in effort. In response to public input and testimony regarding that regulation, a two-fish, any size limit was adopted to better reflect anglers concerns over the restrictiveness of Pend Oreille's regulation package. The two-fish bag will still limit bull trout harvest, especially in the fishery at the mouths of Lightning Creek and the Clark Fork River. Daily take in these hot spot fisheries averages 4/day (John Scott, personal communication) The recommended bag should still allow us to meet the program goal of maintaining the bull trout population.

Lake Coeur d'Alene

Creel Census

Patterns of angling effort and harvest were described for the northern end of Lake Coeur d'Alene in a less intensive effort than in previous years. Effort and harvest were estimated through the season but did not include statistics from the high-yield handline fishery in May and June. Total angling effort for and harvest of kokanee were probably significantly underestimated in the northern end (Table 2).

Interest in the chinook fishery was negligible until August, after a very poor fishing season in 1986. No chinook anglers were surveyed in the north end prior to the August derby. Catch rate for chinook was outstanding at 38 hours per fish during the derby period and represented a thirteenfold improvement over rates in 1986 (Figure 12). Catch rates for kokanee in the northern end declined in 1986 but as mentioned, are probably not reflective of the actual seasonal mean. Because the spring kokanee fishery was not adequately censused, all fishery statistics including effort, catch rate, and harvest were underrepresented. Mean size of angler-caught kokanee was similar in 1987 to that in 1986, and many reports were received from anglers describing improvements in kokanee size. cursory evaluation of age data indicates that recent changes in kokanee size in the catch (1986-1987) may be resulting from shifts in age at maturity, rather than declining specific growth rates.

The fishery on the southern end of Lake Coeur d'Alene was also censused in 1987. Data from the southern end was more representative of the expected seasonal average, and pressure was significantly greater than when last checked in 1985. The south end fishery has become much more prominent, largely due to improved knl-ane fishing.

Table 2. Estimated effort on the north end of Lake Coeur d'Alene, Idaho, April 27 through October 30, and estimated catch rate and harvest of kokanee salmon in 1987.

Anglers interviewed	Average angler count	Estimated effort (hours)	Hours expended for species	Catch rate fish/hour	Estimated harvest
402	North end 50.2	117,449	Kokanee 117,449 Chinook 11,250	Kokanee 0.80 Chinook 0.03 ^a	93,959 350
885	South end 45.0	110,882	Kokanee 95,358 Chinook 5,544 Spiny ray 9,980	Kokanee 1.52 Chinook -- Spiny ray --	144,944
1,287	TOTALS	228,331	Kokanee 212,807 Chinook 16,794 Spiny ray 9,980		238,903

^aCatch rates estimated only during the August "Big One" derby period.

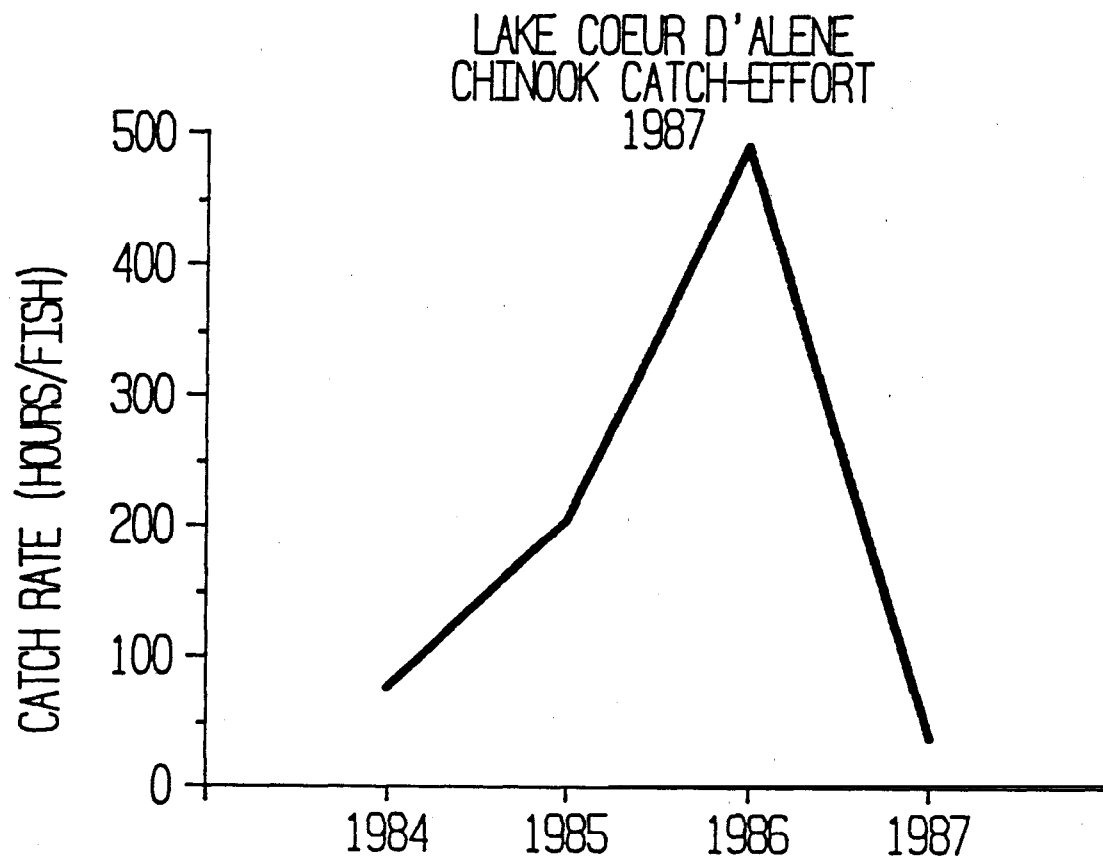


Figure 12. Catch rates for chinook salmon (hours/fish) in Lake Coeur d'Alene, Idaho, 1984-1987.

Total estimated effort on the lake exceeded 239,000 hours in 1987 and may have been greater had the early season fishery been more adequately censused. Caution must be taken in applying these data because total census effort was less than that expended during a "standard" effort. The kokanee fishery on Coeur d'Alene (212,000 hours), however, does appear to be in strong recovery.

Fall Chinook Salmon

One release of 59,000 Lake Michigan stock chinook postsmolts was made on July 1, 1987 (Table 3). Lake Michigan stock chinook are still being used because of their availability and later mean age at maturity than Bonneville stock fish (Table 4). All fish released in 1987 were marked by an adipose fin clip to facilitate evaluation of adult return rates and to quantify "natural" smolt production. Mean size of fish at release was 119 mm, far below the requested target of 145 mm and smaller than six of the eight previous release groups. Although fish were small, special attention was given to the chinook program at Mackay Hatchery in 1987. Fish were kept at optimum loading densities and at maximum growth potential, given hatchery water temperatures. Target chinook size at release (145 mm - July 1) will not be reached at that station without: (1) earlier egg takes, (2) warmer water temperatures, and (3) newer raceway facilities. Given conditions at Mackay Hatchery in 1987, maximum growth potential of chinook was apparently achieved.

Approximately 50 chinook entered Wolf Lodge Creek during September through December 1987. The run was more prolonged than in the past when fish were absent by mid-October. A block weir was placed about 75 m above the Frontage Road Bridge crossing Wolf Lodge Creek, and a fyke was installed approximately 60 m below the block. Most mature chinook did not enter this new trap, however, and were seined from the large pool above the Frontage Road Bridge. The trap will be located between the Frontage and Interstate bridges in 1988.

A total of 34 chinook were spawned in 1987 (27 females; 7 males) yielding 105,000 eggs (3,888/female) for the 1988 program. New hatchery techniques were employed during egg collection, fertilization, disinfecting, and water hardening. Eye-up (80%) was dramatically increased over previous attempts. Females made up 79% of chinook spawned and averaged 94.5 cm in length. Mean total length of males was 97.3 cm and that for all fish combined was 95.2 cm (Figure 13). Adult chinook ranged from 70-114 cm in length. Age composition of spawners shifted toward older fish in 1987, as it did in 1986. Of chinook spawned, 79% were age IV and 21% age V (Figure 14). Mean age of the run was 4.2 years, up dramatically from the average in 1986 (2.5 years). This pattern of greater age at maturity is consistent with that expected for the Lake Michigan stock.

The chinook fishery developed very slowly in 1987, probably due to the poor fishery in 1986. Little effort was expended in comparison to previous years, and the fishery did not begin in earnest until the "Big One" derby in August. Fish stage in Wolf Lodge Bay in August and are still concentrated at mid-depth by the thermocline. This concentration of fish coupled with good fishing conditions provided a catch of around 300 chinook

Table 3. Number, pounds, and length of fall chinook salmon released into Lake Coeur d'Alene, Idaho, during 1982-1987.

Release date	Release location	Number released	Pounds released	Length (mm)		Rearing hatchery	Stock of fish	Comments
				Mean	Range			
7/19/82	Mineral ridge boat ramp	28,700	1,688	137	125-150	Hagerman	Bonneville	
10/5/82	I-90 boat ramp	5,700	600	150	130-170	Hagerman	Bonneville	
TOTAL 1982		34,400	2,288					
8/9/83	I-90 boat ramp	30,100	636	109	80-130	Mackay	Bonneville	
10/26/83	I-90 boat ramp	30,000	1,402	124	80-150	Mackay	Bonneville	
TOTAL 1983		60,100	2,038					
10/29/84	I-90 boat ramp	10,500	820	150	80-190	Mackay and Mullan	Lake Michigan	
TOTAL 1984		10,500	820					
10/16/85	I-90 boat ramp	11,100	900	136	100/110	Mackay and Mullan	Lake Michigan	Left vent. clip
10/17/85	I-90 boat ramp	7,400	600	143			Lake Michigan	Adipose clip
TOTAL 1985		18,500	1,500					
7/2/86	I-90 boat ramp	29,500	825	114	81-145	Mackay	Lake Michigan	Right vent. clip
TOTAL 1986		29,500	825					
7/1/87	I-90 boat ramp	59,400	1,980	119	62-155	Mackay	Lake Michigan	Adipose clip
TOTAL 1987		59,400	1,980					

Table 4. Characteristics of stocks of fall chinook salmon released in Lake Coeur d'Alene, Idaho, 1982-1986.

Stock	Source	% age composition				Approx. weight (lbs)		
		of spawning run				at age of maturity		
		2	3	4	5	3	4	5
Bonneville, Tule ^a Fall (downriver)	Columbia River Federal Hatchery	6	58	35	<1	\bar{x} = 18		
Lake Michigan ^b	Illinois	--	35	55	<2	17-18	26-32	35-40

^aInformation on stock characteristics received via personal communication, Harold Hansen, Oregon Department of Fish and Wildlife.

^bInformation on stock characteristics received via personal communication, Jack Hammond, Michigan Department of Natural Resources.

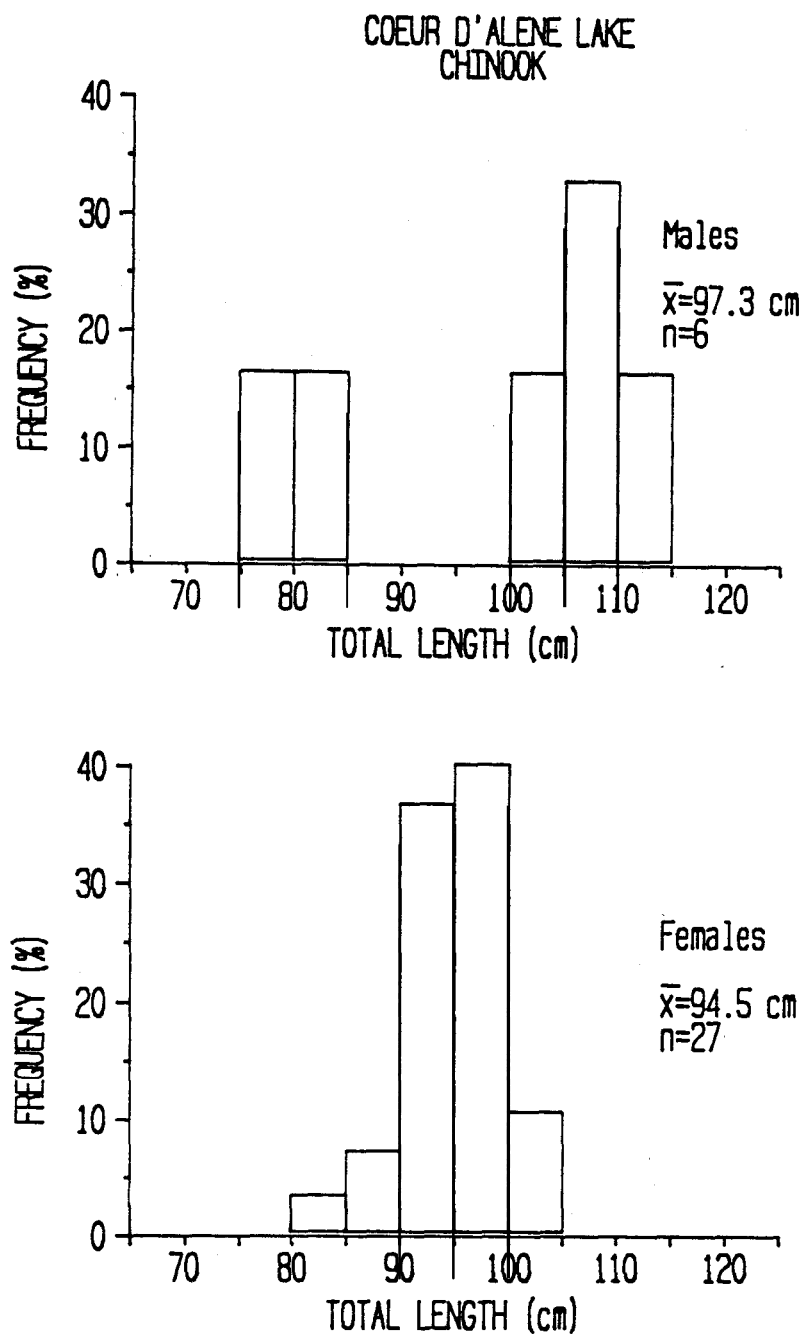


Figure 13. Length frequency of male and female fall chinook salmon spawned in Wolf Lodge Creek, Lake Coeur d'Alene, Idaho, 1987.

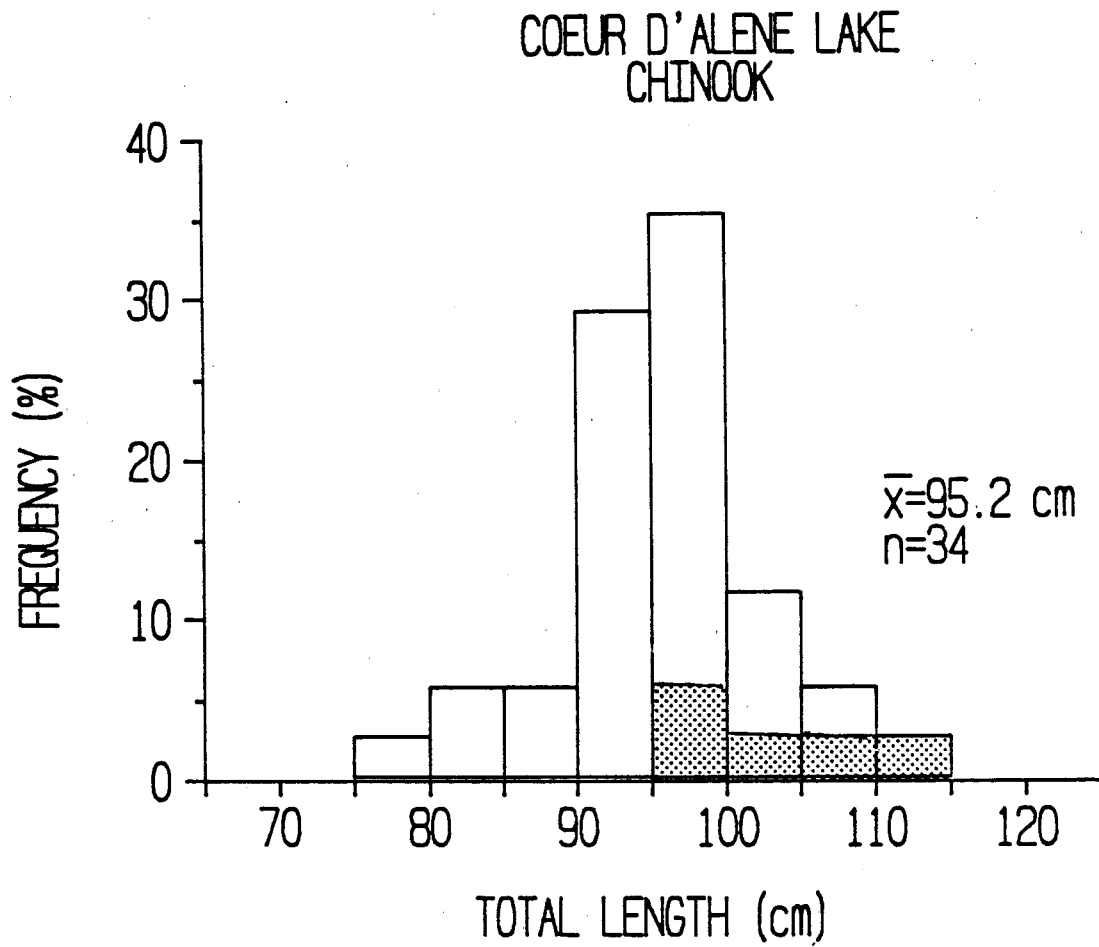


Figure 14. Length and age distribution of mature fall chinook salmon collected in Wolf Lodge Creek, Lake Coeur d'Alene, Idaho, 1987.

mostly in the first 3 days of the 10-day derby. Mean length of chinook in the derby catch was nearly 80 cm and ranged from 35-100 cm (Figure 15). A 19.03 kg (41.9 pounds) chinook won derby honors and was established as a new category in Idaho game fish records, "freshwater chinook". This record lasted only a few weeks when topped by a 19.09 kg catch in early September. Lake Michigan stock chinook are achieving outstanding growth and excellent condition in Coeur d'Alene, with 100 cm fish exceeding 18 kg in weight by age IV (Figure 16). As mentioned catch rates were excellent, averaging 38 hours per fish during the derby period, and strong interest in this fishery was quickly renewed.

Substantial natural reproduction was apparent from the catch of unmarked chinook in Coeur d'Alene during 1987. Although 4- and 5-year-old fish would not have had marks in 1987, age III fish and younger should have carried an adipose or ventral clip. All of our catch data were received from the chinook derby, and with the great catch of large fish that occurred, age III fish and younger were not checked in and were underrepresented in our data. Additionally, age III chinook were not in the spawning run in Wolf Lodge Creek, so marked fish did not appear there in 1987. Close scrutiny of all fish caught in the 1988 derby would provide an accurate picture of the significance of natural reproduction. Our first group of marked fish (1985), although small in number, should show up in the catch and in the Wolf Lodge Creek spawning run as 4-year olds in 1988. Mark efficiency will be evaluated on chinook released in 1988 and beyond to help put the significance of naturalized fish in the catch into better perspective.

As problems in developing a consistent chinook fishery are ironed out, the demand for this opportunity will most likely increase. At the time of the first chinook release, they were viewed simply as a tool to restore the very popular kokanee fishery and to provide a limited trophy catch. Demand for a trophy fishery of this magnitude (the Coeur d'Alene record chinook is only 2 pounds less than the current world "freshwater" record) may appear to overshadow demand for kokanee in the future, and hard decisions will have to be made regarding appropriate management (Figure 17). Opportunity will most likely be optimized by providing a blend of yield and trophy fishing, but may meet with opposition from both sides without a strong information and education program to inform anglers. Social response to our fishery goals should be anticipated and addressed in addition to understanding the biological system.

Cutthroat

Recent research on Coeur d'Alene Lake indicated that cutthroat trout could respond to harvest restrictions and more intensive tributary management (Mauser 1988b). Harvest was not the sole limitation on the fishery, but exploitation in the lake was relatively high. The cutthroat population was estimated at 26,000 fish, and relative density (2.16/ha) was two- to threefold higher than on Pend Oreille, Hayden, and Priest lakes (Mauser 1988a).

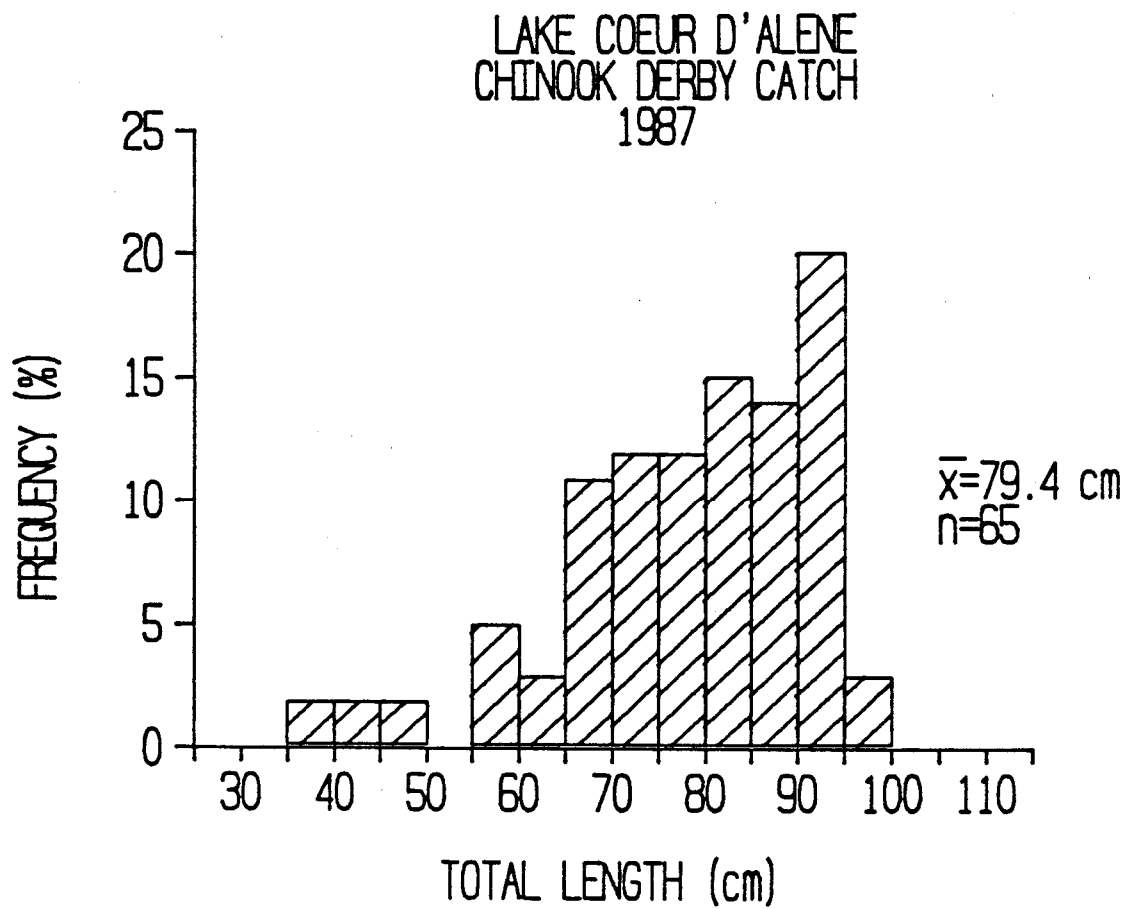


Figure 15. Length composition of fall chinook salmon caught in Lake Coeur d'Alene, Idaho, during the August derby, 1987.

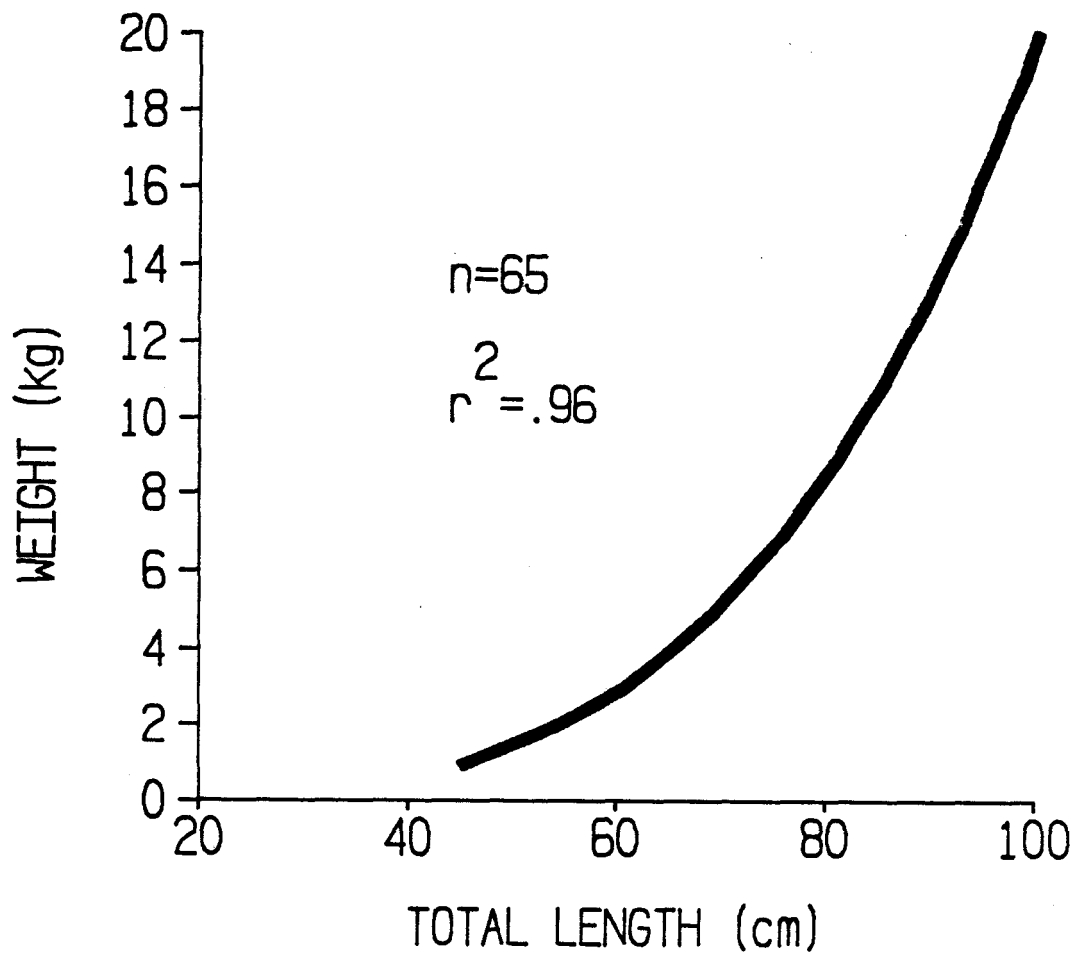


Figure 16. Length-weight relationship of fall chinook salmon from Lake Coeur d'Alene, Idaho, 1987.

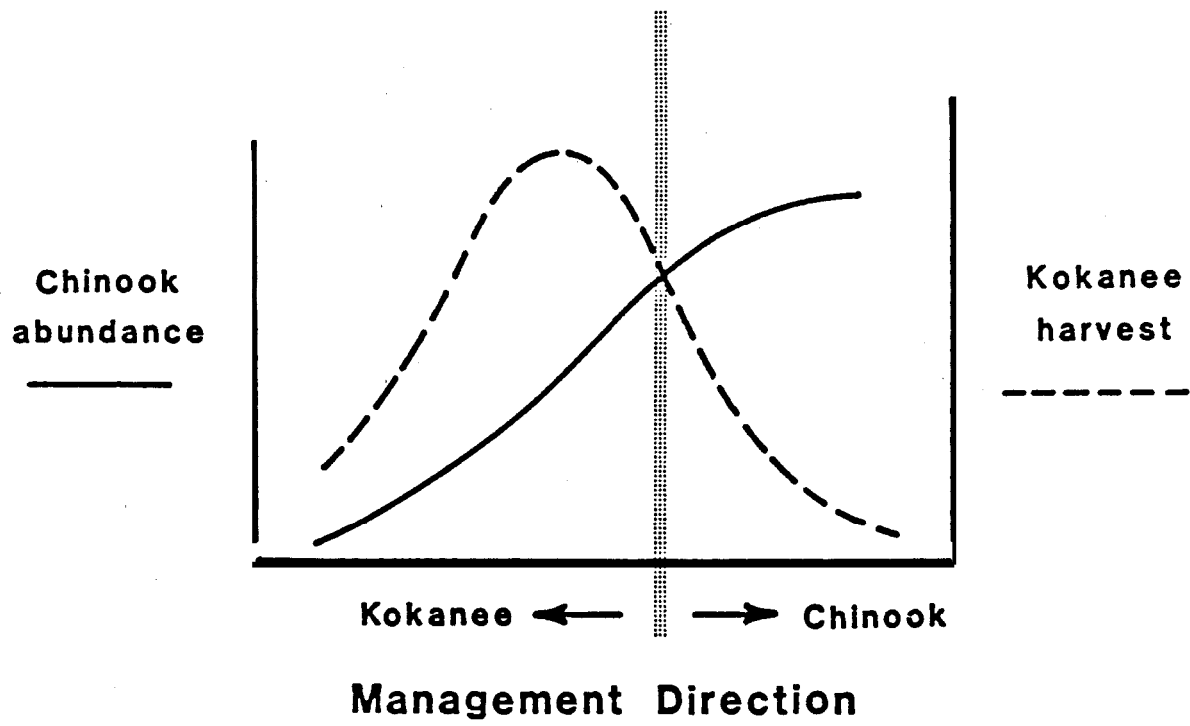


Figure 17. Conceptual model of the probable relationship between kokanee harvest and fall chinook salmon abundance in Lake Coeur d'Alene, Idaho.

Restrictive harvest regulations were recommended and adopted for Lake Coeur d'Alene and its tributaries in 1988. The cutthroat limit of one fish per day, not under 14 inches, was generally accepted by anglers, although the level of restrictiveness agitated some. Performance of the new regulations will be monitored throughout the drainage in coming years in evaluating their appropriateness, the population's response, and angler satisfaction.

Kokanee

Population estimates. Kokanee abundance was estimated at 13.07 million fish in 1987, up over 4 million from 1986, and the greatest abundance ever estimated for Coeur d'Alene (Figure 18). Over half of the total abundance was comprised by age 0+ kokanee (6.88 million), with ages II, III, and IV making up 6.49 million. Trawling on Coeur d'Alene was conducted three weeks earlier in the season in 1987 when fry are in much greater abundance in Wolf Lodge Bay. Estimated abundance of age 0+ kokanee was 220% of the previous eight-year average, reflecting a dramatic difference. Earlier trawling probably accounted for much of the increase in estimated fry abundance.

Abundance of older-aged kokanee (ages II, III, IV) was more stable, but was 24% above the past eight-year **average**. Estimates of older-aged fish are probably not as strongly influenced by timing of sampling as are fry. Abundance of age II and age III/IV kokanee was comparable between 1986 and 1987, but numbers of age II fish were much greater in 1987 (Table 5).

Potential egg deposition (PED) and fry survival. Kokanee spawning escapement was estimated at 814,000 fish in 1987, up over 79,000 from 1986. The ratio of males to females was 53% and 47X, respectively. It was estimated that 382,000 females would have deposited 128 million eggs in 1987 had we not collected spawn in Beauty Bay during the fall. Approximately 4,700 females were spawned, yielding 1.3 million eggs for the Priest Lake enhancement program. Corrected estimates of spawning females and PED were 377,000 and 126 million, respectively. Although female spawning escapement was virtually identical to that in 1986, fecundity was somewhat greater, and PED was up by 24% (Table 6).

Survival estimates from PED to fall fry have ranged from 0.71 (3.9%) in the past, but increased to 6.7% in 1987. The large catch of age 0 kokanee, presumably due to earlier sampling, greatly inflated this annual survival estimate. Large variations in recruitment result from annual variations in female escapement, fecundity, and survival rates. These statistics should be monitored annually to help predict future changes in year-class strength and the fishery.

Length and age at maturity. Length and age at maturity were examined on spawning kokanee collected during Merwin trapping in Beauty Bay in 1987. Mean length of spawners declined for the second year to an average of 241 mm (Figure 19). Mean length of males and females was 244 mm and 238 mm, respectively; it was the first year that females declined since

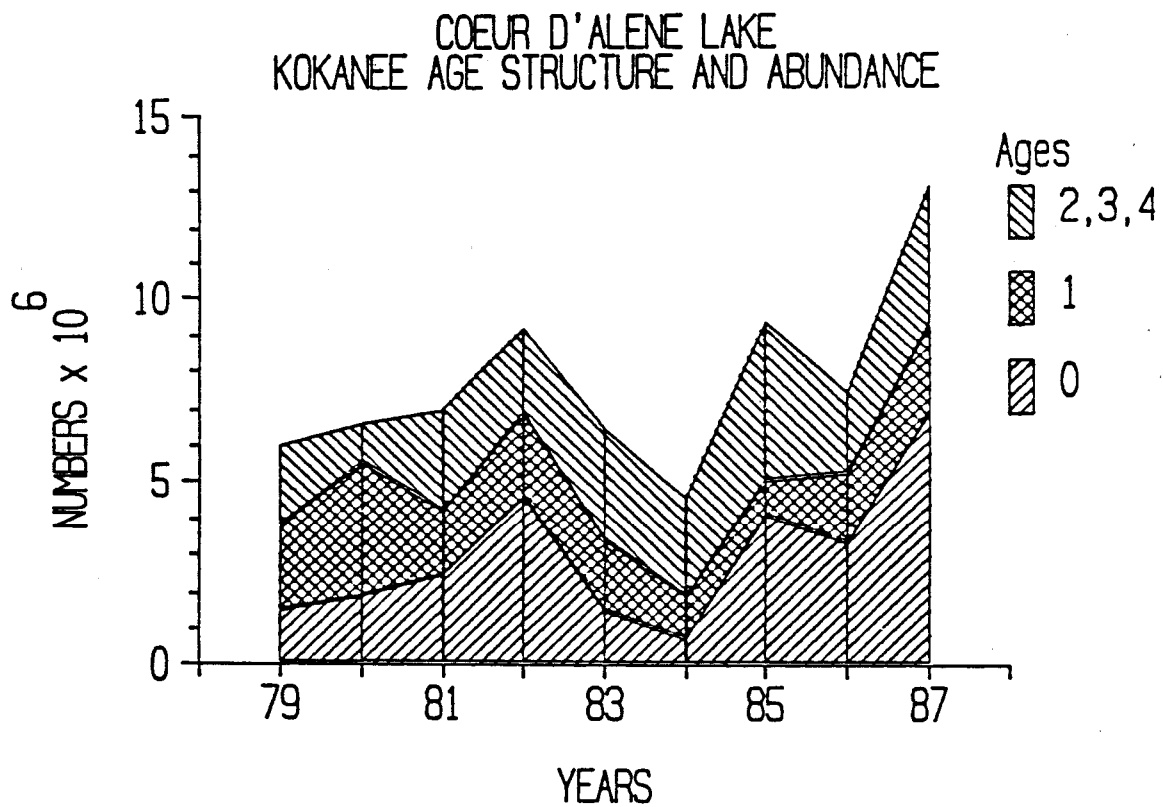


Figure 18. Estimates of kokanee abundance made by midwater trawl in Lake Coeur d'Alene, Idaho, 1978-1987. Selected age groups are represented by differential shading.

Table 5. Estimates of kokanee year classes (1975-86) made by midwater trawl in Lake Coeur d'Alene, Idaho, 1978-1987. Estimates are in millions of kokanee.

Year class	Year estimated								
	1987	1986	1985	1984	1983	1982	1981	1980	1979
1986	6.88								
1985	2.38	2.17							
1984	2.92	2.59	4.13						
1983	0.89	1.83	0.86	0.70					
1982		0.72	1.86	1.17	1.51				
1981			2.53	1.89	1.91	4.53			
1980				0.80	2.25	2.36	2.43		
1979					0.81	1.38	1.75	1.86	
1978						0.93	1.71	1.68	1.50
1977							1.06	1.95	2.29
1976								1.06	1.79
1975									0.45
Total	13.07*	7.31	9.37	4.56	6.48	9.20	6.94	6.55	6.04
No./ha	1353	757	970	472	671	953	719	678	625

Mean number per ha =

*Abundance unusually high in large part because of great numbers of fry sampled. Trawling was conducted earlier in the season and this probably accounts for greater c/f.

Table 6. Estimates of female spawning escapement, potential egg deposition, fall abundance of wild kokanee fry, and their subsequent survival rates in Coeur d'Alene Lake, Idaho, 1979-1987.

Year	Estimates			
	Female spawning escapement	Potential no. eggs (x 10 ⁶)	Fall fry from prev. yr. . escpt. (x 10 ⁶)	Wild survival (%) ^a
1979	256,716	86		
1980	501,492	168	1.86	2.2
1981	550,000	184	2.43	1.45
1982	358,200	120	4.54	2.46
1983	441,376	99	1.51	1.25
1984	316,829	106	0.70	0.71
1985	530,631	167	4.13	3.90
1986	368,633	103	2.17	1.29
1987	377,746	126	6.89	6.68

^aAverage survival of wild fry to fall estimate is 2.0%.

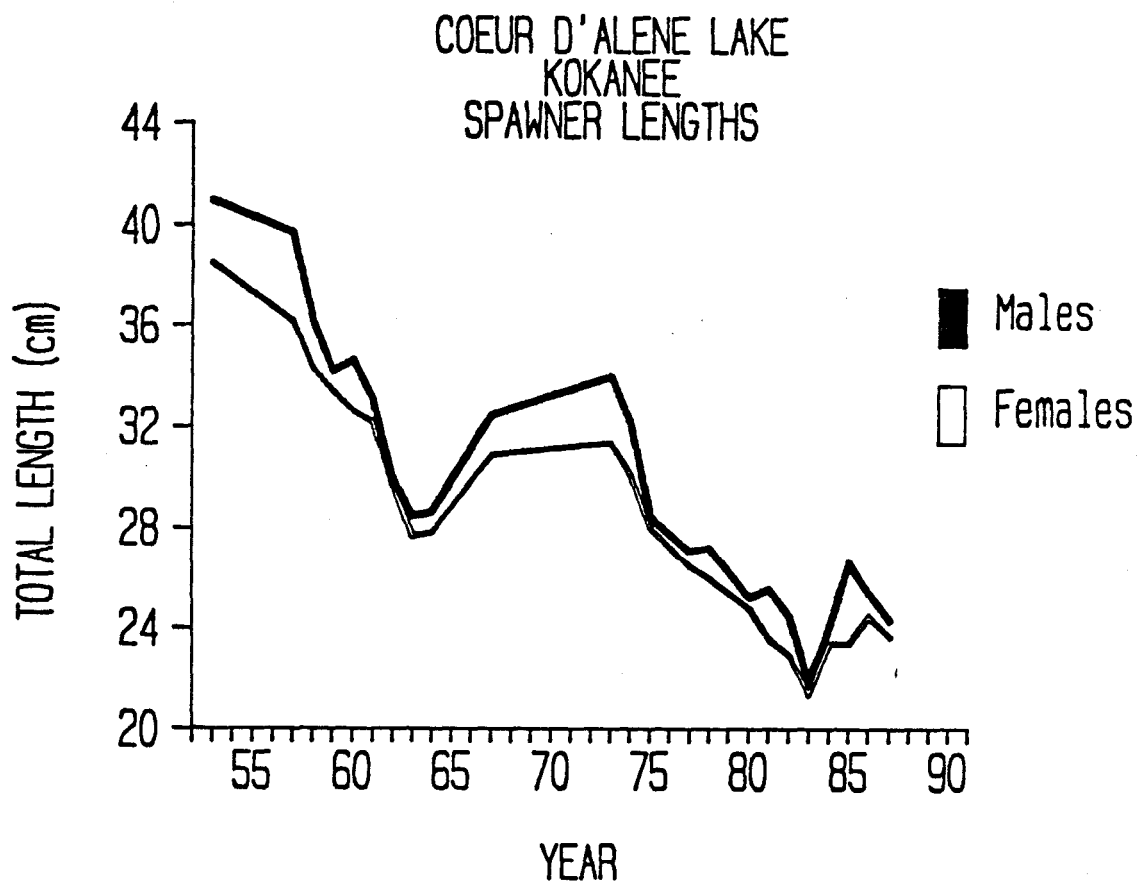


Figure 19. Mean total length of kokanee spawners measured in Lake Coeur d'Alene, Idaho, 1954 to 1987.

1983. Shifts in age composition can have a dramatic influence on average spawner size. This year's decline probably resulted from the appearance of mature two-year olds and the apparent poor growth of the 1982 year class (age 4+) (Figure 20). The distribution of age IV kokanee in the spawner length frequency appears to be an artifact, but agreement among those interpreting age from otoliths was 90X. A small sample size of age 4 fish could have biased the distribution,, or poor growth in the past may have resulted in their small size. Age composition of spawners should continue to be monitored because it has such a strong influence on the size of fish available to anglers and on fecundity and PED.

Kokanee length-weight relationships were graphed for Coeur d'Alene, Spirit, and Pend Oreille lakes as an index of relative condition to evaluate kokanee forage limitations on Coeur d'Alene (Figure 21). Rieman (1982) demonstrated that food limitations depressed kokanee growth, resulting in shifts in age at maturity and a decline in the fishery. Age 0 and 1 kokanee in Coeur d'Alene exhibit significantly better growth and condition than those in Pend Oreille and nearly equal to those in more productive Spirit Lake. As Coeur d'Alene kokanee reach age II, relative condition declines and approaches that for Pend Oreille. Kokanee fry and yearlings appear to do well on small cladocerans and copepods by exhibiting good growth, but require more large cladocerans in the forage base to maintain strong growth and condition. Coeur d'Alene's kokanee food limitation appears to most strongly influence age II and older fish.

The collection of reliable data on kokanee population dynamics in Coeur d'Alene Lake is a high priority for Region 1 fishery management. Precision of the information will become increasingly important as the complexity of chinook and kokanee management increases.

Spirit Lake

Spirit Lake supports a diverse salmonid and spiny ray fishery, with kokanee and catchable rainbow supporting most of the fishing effort. The kokanee fishery continues to be the best in the region, and it should be closely monitored so appropriate management action can be taken to sustain the program. Kokanee recruitment is highly variable and poor year classes can be detected during annual trawling, allowing augmentation of that cohort. The kokanee population is at theoretical carrying capacity in Spirit Lake, and heavy fishing pressure should be maintained to avoid the negative affects of overpopulation.

Kokanee Population Estimates

Kokanee abundance was estimated at 670,200 fish in July 1987. Abundance increased by over 200,000 (43X) from that in 1986 (Figure 22), resulting from somewhat better recruitment and possible overestimation of the 1984 year class (Table 7). A total of 60,800 kokanee fry were stocked in Spirit Lake in August 1987 to offset apparently weak recruitment. This supplemental release increased kokanee abundance to an estimated 731,000 fish. Occasional hatchery supplementations appear to be important in

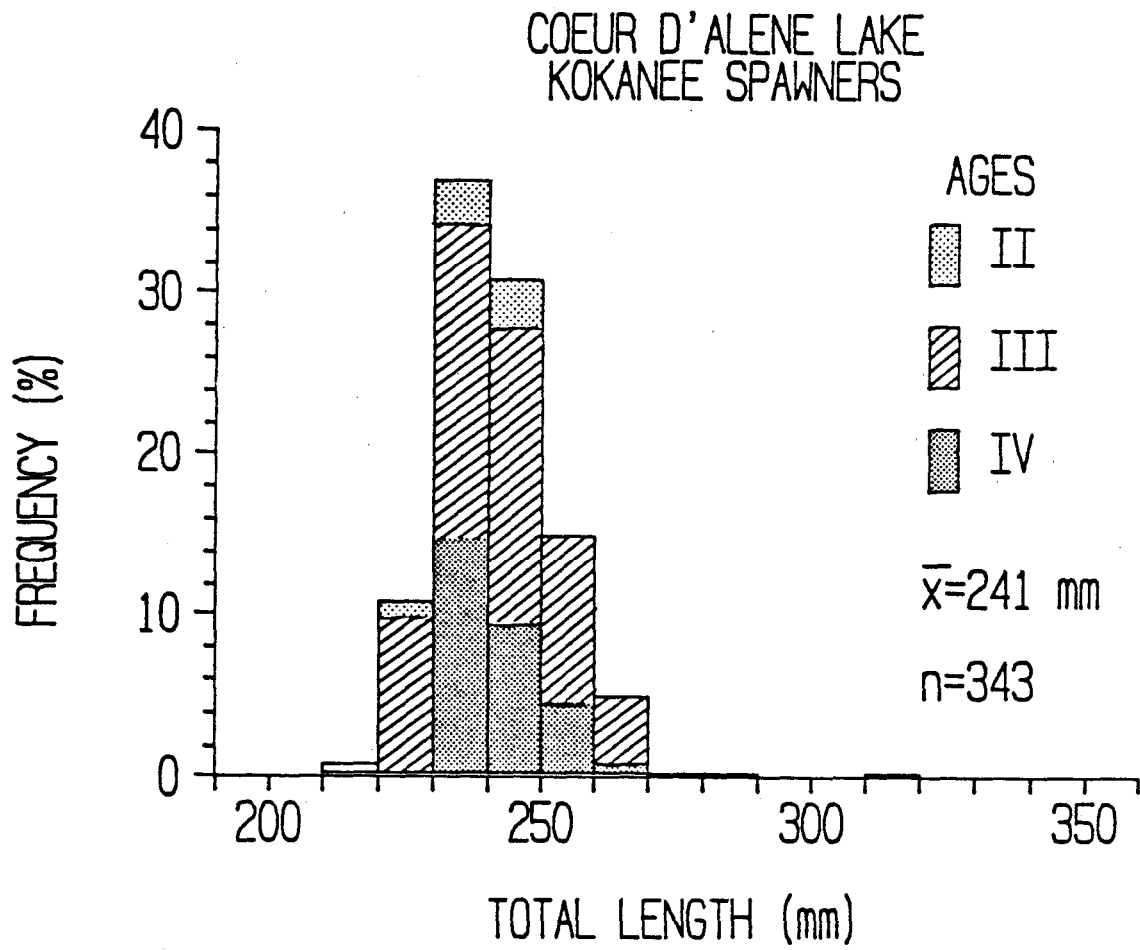


Figure 20. Age and length composition of spawning kokanee collected in Lake Coeur d'Alene, Idaho, 1987.

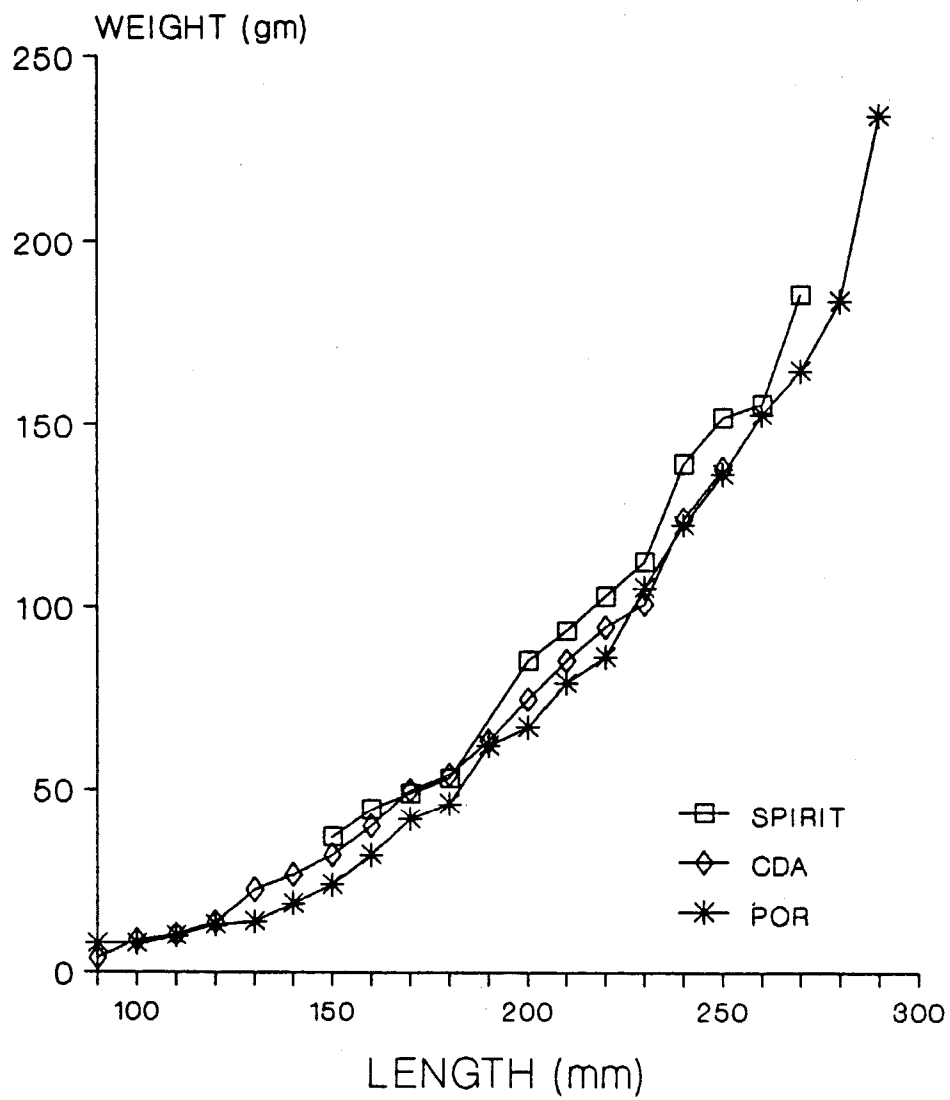


Figure 21. Length-weight relationships of kokanee from Spirit, Coeur d'Alene, and Pend Oreille lakes, Idaho, 1987.



Figure 22. Estimates of kokanee abundance made by midwater trawl in Spirit Lake, Idaho, 1981 to 1987.

Table 7. Estimates of kokanee year classes (1977-1986) made by midwater trawl in Spirit Lake, Idaho, 1981-1987. Estimates are in thousands of kokanee.

Year class	Year estimated						
	1987	1986	1985	1984	1983	1982	1981
1986	46.3						
1985	178.7	16.6					
1984	347.5	287.3	164.4				
1983	97.6	107.9	206.8	3.5 ^a			
1982		56.5	113.2	17.4	143.3		
1981			74.3	160.8	272.6	526.0	
1980				103.1	146.8	209.0	281.3
1979					54.2	57.7	73.4
1978						48.0	82.1
1977							92.6
Totals	670.1	467.7	558.7	284.8	616.8	840.7	529.4
No./ha	1,169	816	975	497	1,076	1,467	924

Mean number per ha = 989

^a100,000 kokanee fry were released in 1984 to supplement this weak year class.

moderating variable recruitment, although sampling error appears to be responsible for at least half of this variability. Overall, the population is in good shape, with abundance and densities similar to those in 1982 and 1983. Spirit Lake appears to support densities of kokanee in the range of 900 to 1,000/ha without their growth being impacted. Precluding major changes in spawning areas, water quality and fishing pressure, these densities seem to be well within the carrying capacity of Spirit Lake.

Estimates of age-specific annual survival were intermediate for age 0+ fish, reflecting apparent weak recruitment. Survival of other ages was greater than the long-term averages for the lake (Table 8). Both sampling problems with trawl gear (apparently undersampling age 0s) and hatchery supplementation have resulted in excessive age-specific survival estimates. These problems strongly indicate the need for development of a computer simulation model to monitor stock changes as management becomes more complex.

Potential Egg Deposition and Fry Survival

Spawning escapement of female kokanee was estimated at 50,200 fish in 1987. Potential egg deposition was estimated at 15.9 million eggs (Table 9). Kokanee survival from embryos to fall fry was estimated at 0.29%, representing a fourfold increase over 1986 but well below the six-year mean of 0.75%.

Lowland Lakes Program

Routine Census

During 1986, we continued routine data collection to describe fishing effort and success on Region 1 lowland lakes. Most data were collected by conservation officers, but other regional personnel participated. The intent is to provide consistent, long-term data on waters other than those evaluated in research programs. Data are used to evaluate the success of management programs and detect areas in need of greater attention.

Complete census data were collected by officers on 12 lakes in 1987, the same number as in 1986 (Table 10). Coeur d'Alene Lake continued to have the greatest effort of the lakes censused at 228,000 hours. Hayden, Pend Oreille (northern shore), and Fernan lakes continued to be some of the more heavily used waters in the region. Effort decreased on Hayden Lake (13%) for the first time in several years, and changes in fishing pressure on other waters were somewhat variable (Table 11). Catch rates varied widely among lakes in each census year, but mean catch rates for salmonids for all lakes censused were similar among years (1984 = 0.44 fish/hour, 1985 = 0.5 fish/hour, 1986 = 0.4 fish/hour, and 1987 = 0.5 fish/hour). Mean catch rates for warmwater fisheries has been somewhat more variable.

Opening day census data have been maintained specifically for several years on Hauser, Jewell, Kelso, Mirror, Spirit, Lower Twin, and Round lakes (Table 12). Opening day catch rates are often variable, but fishing is typically good. Catch rate for brook trout in Mirror Lake has remained low

Table 8. Estimates of age-specific annual survival for kokanee in Spirit Lake, Idaho.

Year class	Age span			
	0+ egg to fry	0+ to 1+	1+ to 2+	2+ to 3+
1978				58
1979			79	94
1980		74	70	70
1981	2.56	52	59	46
1982	0.93	12	651 ^a	50
1983	0.02	199 ^a	52	90
1984	0.53	175 ^a	121 ^a	
1985	0.07	1,077 ^a		
1986	0.29			
Mean annual ^b survival (%)	0.73	72.5	76.3	68.0

^aOverestimated survival resulting from biases with trawl gear.

^bValues of overestimated survival were corrected to 1002 for calculating means.

Table 9. Estimates of female spawning escapement potential egg deposition, fall abundance of wild kokanee fry, and their subsequent survival rates in Spirit Lake, Idaho, 1981-1987.

Year	Estimates			
	Female spawning escapement	Potential no. eggs (x 10 ³)	Fall fry from prev. yr. . escapement	Wild survival (%) ^a
1981	44,650	20,540	--	--
1982	26,400	15,400	526,000	2.56
1983	33,463	18,237	143,300	0.93
1984	57,457	26,430	3,494	0.02 ^a
1985	55,326	25,726	164,400	0.62
1986	36,564	11,591	16,600	0.07 ^a
1987	50,186	15,908	46,337	0.29

^aAverage survival of wild fry is 0.75%.

Table 10. Routine census data collected on lakes in Region 1, Idaho, during 1987.

Lake	Anglers interviewed	Mean angler count	Estimated hours	Hours/acre	Catch rates				
					HRB	CT	Total KOK	salmo	Spiny ray
Brush Apr-Sept	62	6.2	14,491	491	.35	--	--	.35	--
Cocolalla Apr-Sept	52	10.4	24,307		.32	--	--	.32	1.26
Coeur d'Alene Apr-Sept	1,287	46.5	228,331	7.3		--	1.12	1.15	--
Fernan Apr-Sept	341	37.9	88,558		.11	--	--	.11	.33
Hauser Apr-Sept	435	24.2	51,222	92	.08	--	--	.08	.27
Hayden Apr-Oct	814	23.5	76,078	28	.02	.01	--	.03	2.30
Kelso Apr-Sept	32	10.7	25,000		.62	--	--	.62	--
Pend Oreille ^a Apr-Sept	353	35.3	82,506	8	--	--	--	--	--
Pend Oreille River Apr-Sept	206	14.7	34,358	--		--	1.8	1.8	.24
Priest Apr-Sept	198	24.8	57,848	--	-	--	--	.76	--
Robinson Apr-Sept	84	7.0	16,361	--	.64	--	--	.64	.02
Round Apr-Sept	69	6.9	16,127	--	.72	--	--	.72	--
Spirit Apr-Sept	140	20.0	46,746	--	.04	--	4.6	5.0	--
Smith Apr-Sept	62	5.2	12,060	--	.33	--	--	.33	--

^aNorth shore of Lake Pend Oreille near mouth of Clark Fork River.

Table 11. Comparative estimates of effort and catch rate on lakes in Region 1, Idaho, during April through September, 1983-84, 1985, 1986, and 1987.

Lake	Mean anglers inter viewed (n)	Effort (hours)				Hours/acre				Overall catch rate							
		1983-4	1985	1986	1987	1983-4	1985	1986	1987	1983-84		1985		1986		1987	
										Sal- monids	spiny ray	Sal- monids	spiny ray	Sal- monids	spiny ray	Sal- monids	spiny ray
Coeur d'Alene ^a	574	--	192,168	172,45	117,449	--	--	--	--	0.92 ¹	--	1.30 ¹	--	1.22 ¹	--	0.83	--
Hauser	410	49,500	75,210	66,710	51,222	89	135	121	92	0.26	0.16	0.24	0.11	0.25	0.44	0.08	0.27
Fernan	307	63,000	67,742	72,000	88,558	163	176	176	--	0.14	1.60	0.34	0.57	0.12	0.31	0.11	0.33
Hayden	545	40,500	80,776	87,360	76,078	11	30	32	28	0.03	0.96	0.05	0.38	0.06	0.20	0.03	2.30
Pend Oreille ^b	365	--	66,000	82,393	82,506	--	6	8	8	--	--	0.24 ¹	--	0.02	--	--	--
Chatcolet	82	--	26,645	23,338	--	--	--	--	--	--	--	--	0.93	--	1.14	--	--
Upper Twin	40	--	17,401	16,000	--	--	35	32	--	--	--	0.19	--	--	--	--	--
Lower Twin	115	--	39,742	37,900	--	--	132	125	--	--	--	0.20	0.55	0.26	0.05	--	--
Brush	68	--	35,542	14,265	14,491	--	1,22	491	491	--	--	0.45	--	0.71	0.11	0.35	--
Coeur d'Alene ^c	533	--	34,803	--	110,882	--	--	--	--	--	--	1.10 ¹	0.03	--	--	1.52	--
Robinson	103	--	24,025	25,303	16,361	--	480	505	--	--	--	0.63	--	0.38	0.09	0.64	0.02
Smith	68	--	13,455	12,972	12,060	--	354	341	--	--	--	0.45	0.06	0.80	0.03	0.33	--
Round	45	13,100	--	--	16,127	252	--	--	--	0.83	0.40	0.75	--	--	--	0.72	--
Dawson	3	--	--	--	--	--	--	--	--	--	--	--	3.00	--	--	--	--
Mirror	36	--	--	--	--	--	--	--	--	--	--	0.24	--	0.33	--	--	--
Benewah	19	--	--	17,207	--	--	--	--	--	--	--	--	1.14	--	2.25	--	--
Perkins	12	--	--	--	--	--	--	--	--	--	--	--	2.51	0.27	0.20	--	--
Jewell	13	--	--	9,900	--	--	--	--	--	--	--	0.36	0.36	0.07	0.28	--	--
Cocolalla	43	--	--	--	24,307	--	--	--	--	--	--	0.22	--	--	--	0.32	1.26
Solomon	20	--	--	--	--	--	--	--	--	--	--	0.46	--	--	--	--	--
Bonner	4	--	--	--	--	--	--	--	--	--	--	1.00	--	--	--	--	--
Glidden	28	--	--	--	--	--	--	--	--	--	--	0.98	--	--	--	--	--
Kelso	42	--	--	19,060	25,000	--	--	--	--	--	--	0.45	0.17	0.70	0.19	0.62	--

Table 11. Continued.

Lake	Mean anglers inter viewed (n)	Effort (hours)				Hours/acre				Overall catch rate							
										1983-84		1985		1986		1987	
		1983-84	1985	1986	1987	1983-	1985	1986	1987	Sal- monids	Spiny ray	Sal- monids	Spiny ray	Sal- monids	Spiny ray	Sal- monids	Spiny ray
Porcupine	21	--	--	--	--	--	--	--	--	--	--	5.97 ^d	--	0.98	--	--	--
Roman Nose #1	4	--	--	--	--	--	--	--	--	--	--	0.50	--	--	--	--	--
Freeman	15	--	--	--	--	--	--	--	--	--	--	0.07 ^e	1.40	0.83	--	--	--
Rose	6	--	--	--	--	--	--	--	--	--	--	--	0.31	--	--	--	--
Ball	6	--	--	--	--	--	--	--	--	--	--	0.67	--	--	--	--	--
Sheperd	15	--	--	--	--	--	--	--	--	--	--	--	2.50	--	1.0	--	--

^aNorth end of Lake Coeur d'Alene, including wolf Lodge Bay.

^bNorth shore of Lake Pend Oreille near mouth of Clark Fork River.

^cSouth end of Lake Coeur d'Alene, but not including Lake Chatcolet.

^dSmall sample size and some confusion in data sheets.

^eOpening day information only.

^fPrimarily kokanee.

Table 12. Opening day catch rates for salmonids on selected lowland lakes in Region 1, Idaho, 1982-1987.

Lake	Year	Anglers inter- viewed	Hours fished	Catch rate (fish/hour)					Combined catch rate
				Rb	Ct	Bk	BN	KOK	
Hauser	1982	128	295	0.18	--	0.01	--	--	0.19
	1983	86	126	0.64	--	0.01	--	-	0.65
	1984	75	194	0.46	--	--	--	-	0.47
	1985	42	120	0.32	0.02	--	--	--	0.33
	1986	116	343	0.33	--	--	--	--	0.33
	1987	175	529	0.32	--	0.01	--	--	0.33
Jewell	1982	28	98		0.17	--	--	0.04	0.21
	1983	28	26		0.19	--	--	--	0.19
	1984	11	9		0.44	--	--	--	0.44
	1985	3	6		0.67	--	--	--	0.67
	1986	--	--		--	--	--	--	--
	1987	6	--	0	--	--	--	--	--
Kelso	1982	43	134	0.44	--	--	0.01	--	0.45
	1983	73	163	0.85	--	--	--	--	0.85
	1984	85	186	1.19	--	--	--	--	1.19
	1985				--	--	--	--	--
	1986	21	56	0.75	--	--	--	--	0.75
	1987	84	115	1.28	--	--	--	--	1.28
Mirror	1982	133	458	--	0.03	1.31	0.04	--	1.38
	1983	143	498	--	--	1.30	0.03	0.02	1.35
	1984	138	353	--	0.16	0.24	0.01	--	0.42
	1985	35	175	--	--	0.11	0.10	--	0.21
	1986	20	43	--	--	0.21	0.09	0.02	0.32
	1987	34	117	--	0.85	0.05	0.03	0.05	0.98
Spirit	1982	124	348	0.05	0.01	--	--	0.28	0.34
	1983	121	258	0.12	--	0.01	--	0.69	0.82
	1984	--	--	--	--	--	--	--	--
	1985	--	--	--	--	--	--	--	--
	1986	30	27	0.15	--	--	--	--	0.15
	1987	76	98	0.27	0.04	--	--	0.02	0.33
Lower Twin	1983	99	365	0.19	0.01	0.01	--	--	0.21
	1984	40	40	0.52	--	--	--	--	0.52
	1985	43	85	0.22	--	--	--	--	0.22
	1986	35	43	0.14	--	--	--	--	0.14
	1987	23	46	0.46	--	--	--	0.02	0.48
Round	1984	10	35	0.37	0.37	--	--	--	0.74
	1985	15	60	0.25		0.35	--	--	0.60
	1986	--	--	--	--	--	--	--	--
	1987	11	11	2.54	--	--	--	--	2.54
Hayden	1986	76	183	0.04	0.02	--	--	--	0.06
	1987	142	181	0.14	0.03	--	--	--	0.17

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since stocking was reduced, resulting in a decrease of about 1.25 fish/hour in the combined catch rate. Although high variability complicates the interpretation of these data, evaluation of mean catch rates revealed that Hauser (.38/hour), Jewell (.38/hour), Spirit (.41/hour), and Lower Twin (.31/hour) were quite similar. Kelso (.9/hour), Mirror (.78/hour), and Round (1.29) supported similar but substantially greater mean catch rates, while catch rates for Hayden (0.12/hour) were lowest. Catch rates for Hayden's trophy bass and trout fishery were good considering the quality they provide.

Catchable Rainbow Trout Program Evaluation

The continual increase in demand for catchable trout highlights the need to better allocate this limited resource in order to achieve program goals. Standardization of stocking rates (number/area) continued for catchable rainbow trout to facilitate evaluation of the program in lakes of Region 1. Small lakes were stocked at 250 to 400 fish/ha and very large lakes at 3 to 6 fish/ha. Smaller lakes received higher densities of fish, but overall numbers stocked in each lake were relatively low. Stocking densities on intermediate lakes range from 10 to 60 fish/ha. Although stocking rate is realistically a function of lake size, it can be adjusted where effort and rate of return make that appropriate.

We continued to use data from conservation officer census, historic census, and tag returns to further evaluate the program in 1987. Catchable returns from tagging data were corrected for noncompliance bias by using reward tags as described by Rieman (1983). Rate of return was estimated on four lakes in 1984, five in 1985, six in 1986, and on four lakes in 1987 (Table 13). Return rates were 63% for Kelso Lake, Elsie - 63%, Gene Day Pond - 68%, and Day Rock Pond - 48%. Return to creel was excellent on all waters evaluated in 1987, and the mean rate (60.5%) was twice that of any previous evaluation year. Stocking rates for lakes in 1987 were consistent with models developed for evaluating stocking, catch, and return rates. Since creel data were not collected on three of the four waters evaluated in 1987, regression relationships were not expanded to incorporate the information.

Evaluation of return to creel has to date been based on the initial year of return. We have continued monitoring return data from sequential years on several lakes and have developed a better idea of the importance of cumulative return on those waters (Table 14). Good second-year returns may indicate that those systems provide good habitat for winter holdover, or that rainbow strains stocked were heartier, or both. Continued evaluation of multiple-year returns would be useful in comparing appropriateness of strains for particular waters and for judging suitability of lakes for holdover potential.

Additional data are obviously needed in evaluating of the catchable trout program, especially with respect to factors influencing return to the creel. Not only would we like to better predict return to creel on a given system, but a definition of "acceptable" rates of return would provide a

Table 13. Lake area, catchable rainbow trout stocking level, catch rate, return to creel, and fishing pressure on lakes in Region 1, Idaho, 1984-1986.

Lake	Area		Current stocking rate		Estimated % return	Catch rate (fish/hour)	Fishing pressure (hours/acre)	Total hours
	Acre	Ha	#/acre	#/ha				
Robinson	50	20	159	392	10 ^b	0.57	480	24,025
Brush	29	12	136	329	12 ^b	0.40	1,225	35,542
Lower Twin	300	121	18	45	20	0.18	132	39,742
Upper Twin	500	202	8	20	14 ^b	0.18	35	17,401
Fernan	392	158	60 (75)	148	50 ^a	0.14 (0.34)	160	56,000
Hauser	554	224	20 (25)	49	35 ^a	0.26 (0.24)	90	50,000
Spirit	1,620	656	6 (7)	15	50 ^a	0.07	43	70,000
Pend Oreille R.	2,956	1,196	3	8	6 ^a	--	--	--
Cocolalla	770	312	20 (26)	49	6 ^a	0.22 (0.22)	--	--
Round	52	21	100 (96)	247	80+ ^a	0.83 (0.20)	252	13,000
Smith	38	15	55	137	20	0.80	344	13,096
Bonner	23	9	135	333	25	1.00		
Kelso	61	25	165	403	63 ^c	0.62	312	19,060
Elsie	20	8	150	375	63 ^c		--	--
Glidden	25	10	121	302	--	0.46	--	--
Porcupine	13	5	77	200	--	0.35	--	--
Dismal	10	4	49 (49)	122	--		--	--
Stoneridge	30	12	100	250	--	0.29	--	--
Jewell	301	122	10	24	11	0.28	38	11,508
Freeman	40	16	100	250	6	0.83	--	--
Gene Day Pond	--	--	--	--	68 ^c	--	--	--
Day Rock Pond	--	--	--	--	48 ^c	--	--	--

^aReturn to creel data from 1984.

^bReturn to creel data from 1985.

^cReturn to creel data from 1987.

() stocking rate in 1985 where 1984 data are used to estimate return to creel.

Table 14. Return to creel data for initial and sequential years on catchable rainbow trout in selected lakes of Region 1, Idaho.

Lake	# tagged			Percent return					
				Cumulative		1984	1985	1986	1987
	Reg	Reward	Year	%	# years				
Fernan	180	20	1984	52	4	50	1	0	1
Hauser	180	80	1984	47	4	35	10	2	0
Spirit	180	20	1984	50	4	50	0	0	
POR	180	20	1984	7	4	6	1	0	
Cocolalla	180	20	1984	6	4	6	0	0	
Round	180	20	1984	82*	4	80*	2	0	
Robinson	180	20	1985	15	3		10	5	0
Brush	180	20	1985	14	3		12	2	0
Upper Twin	180	20	1985	14	3		14	0	2
Lower Twin	180	20	1986	30	2			20	10
Smith	180	20	1986	26	2			20	6
Bonner	180	20	1986	40	2			25	15
Jewell	180	20	1986	26	2			11	15
Freeman	180	20	1986	6	2			6	0
Kelso	180	40	1987	63	1				63
Gene Day	114	40	1987	68	1				68
Day Rock	113	40	1987	48	1				48
Elsie	113	40	1987	63	1				63

consistent basis for identifying viable programs. Refining the stocking model will help to efficiently provide catch rates consistent with goals of the five-year plan for lakes of Region 1.

Mean catch rates for hatchery catchable rainbow on several small lakes were examined to determine whether the target of 0.5 fish/hour was being met. Average catch rates exceeded 0.5 fish/hour on four of six systems evaluated (Robinson, Brush, Round, and Kelso lakes, mean = 0.6/hour). The mean on the other two waters (Cocolalla and Smith lakes) was 0.33/hour. Prescribed stocking rates appear in general to be meeting target catch rates for small lakes but the evaluation should continue. A better understanding of factors influencing catch rates is still needed. Where fishing pressure is intense or return to creel great, stocking rates could be increased. In systems where fishing pressure and return to creel are consistently very low, efforts should be made to direct more pressure to the lake or stocking should be reduced or eliminated. Stocking requests will be continually modified to be consistent with these goals.

Lake Surveys

Hayden Lake

The status of Hayden Lake's smallmouth bass was re-evaluated in 1987, specifically in relation to the new 14-inch minimum size regulation development for 1988-1989. Smallmouth bass are doing very well in Hayden Lake and three new year classes have become established (Figure 23). Age 1 bass are typically undersampled by electrofishing, but recruitment is also declining simultaneously. Sources of recruitment have been the original release of adults whose numbers were small and declining, and two releases of hatchery fish. Natural recruitment will continue to decline until newly established year classes reach maturity, probably in 1989 (Figure 24). Smallmouth have exhibited good growth in the lake and early length-at-age of young fish is intermediate and comparable to that for the Snake River. Growth of smallmouth was projected through age X and a likely range was developed using values from Carlander (1969) (Figure 24). The 14-inch minimum size adopted for bass on Hayden Lake should protect smallmouth at least through first spawning, even at the most optimistic growth rates. At the poorest growth projected, the fishery would basically be catch and release, but growth should be somewhat above this minimum. Biannual monitoring of population dynamics and age structure should be adequate to determine the suitability of the regulation.

Largemouth bass are also under the new harvest regulation of one fish, not under 14 inches. Evaluation of actual largemouth bass growth through a full age structure was possible because they were well established in Hayden Lake and enhanced by the bass closure (Figure 25). The 14-inch minimum size will protect most largemouth through first spawning, but will not provide the same level of quality angling as it will for smallmouth. Compliance with the minimum-size regulation will be critical if the trophy component of the largemouth population is to be maintained.

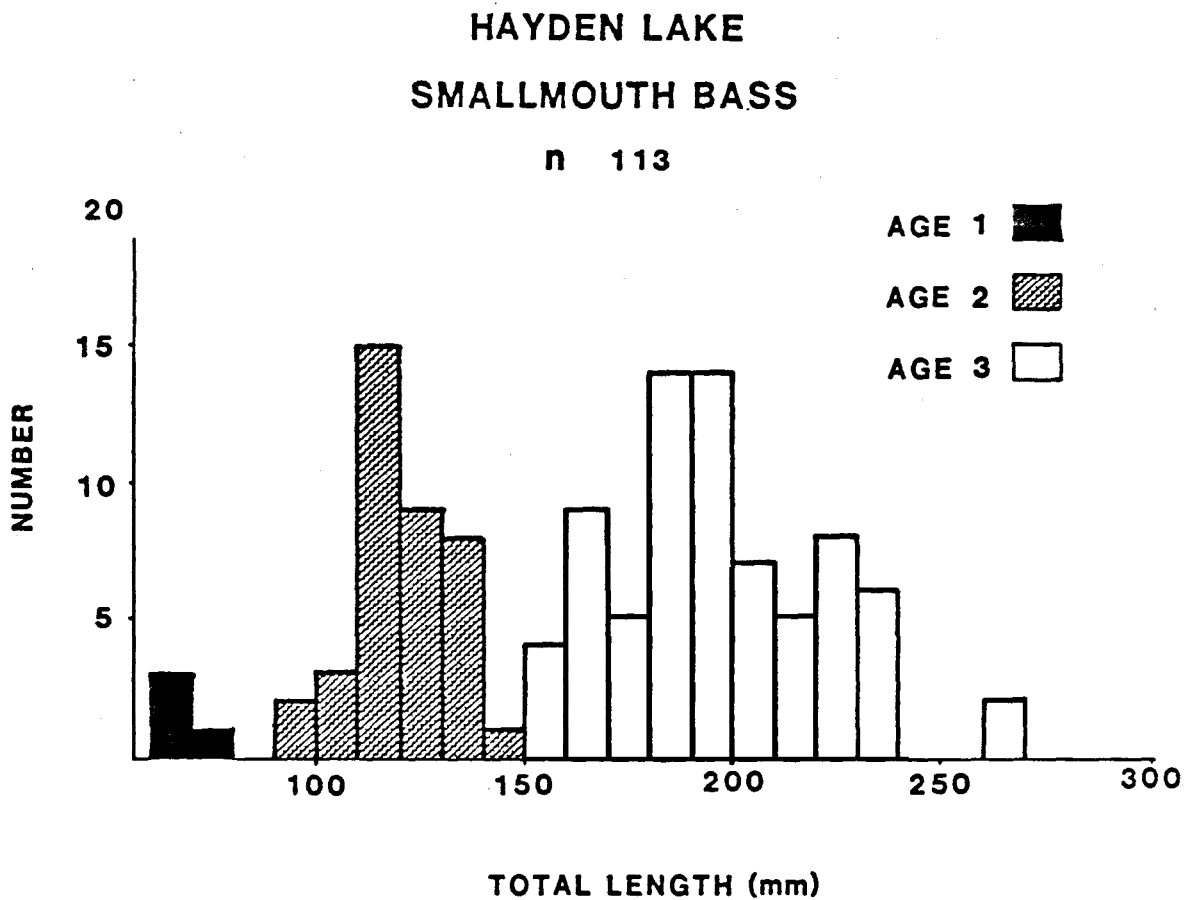


Figure 23. Length and age composition of smallmouth bass collected by electrofishing in Hayden Lake, Idaho, 1987.

HAYDEN LAKE - SMALLMOUTH

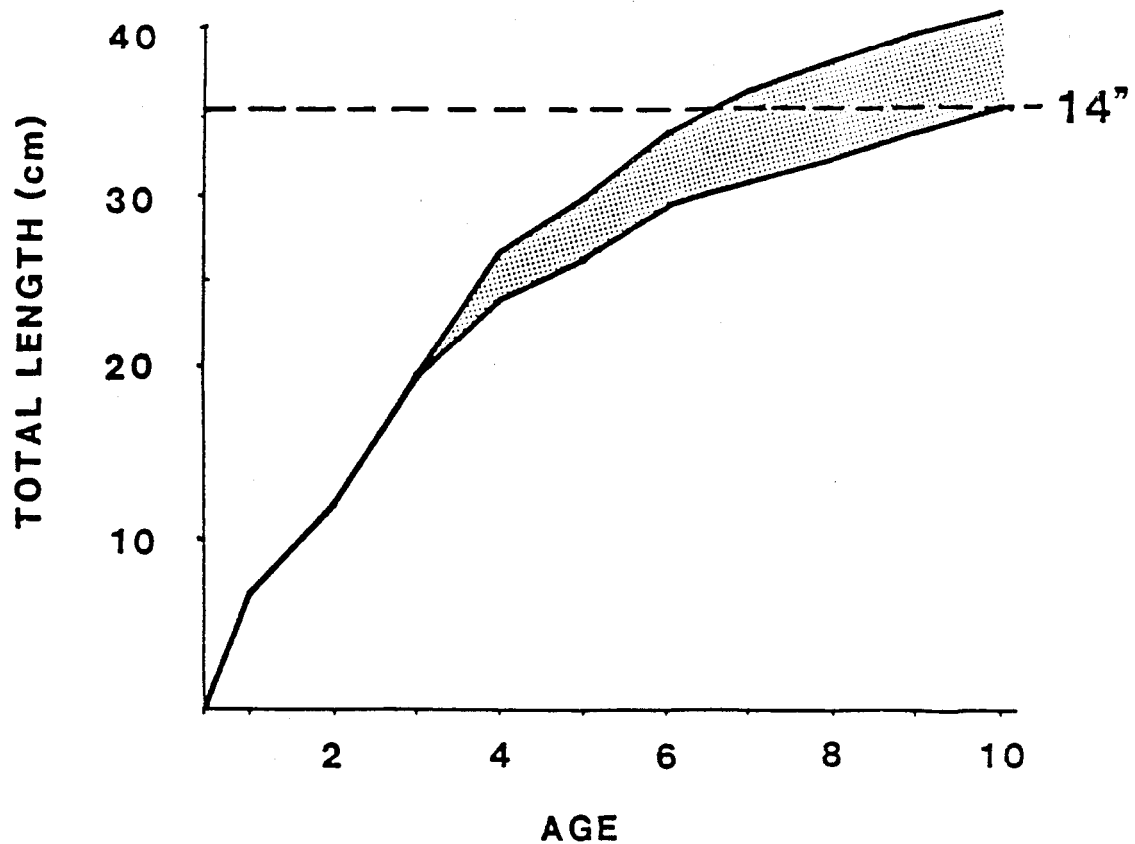


Figure 24. Documented and projected growth of smallmouth bass, with reference to the 14-inch minimum size regulation on Hayden Lake, Idaho.

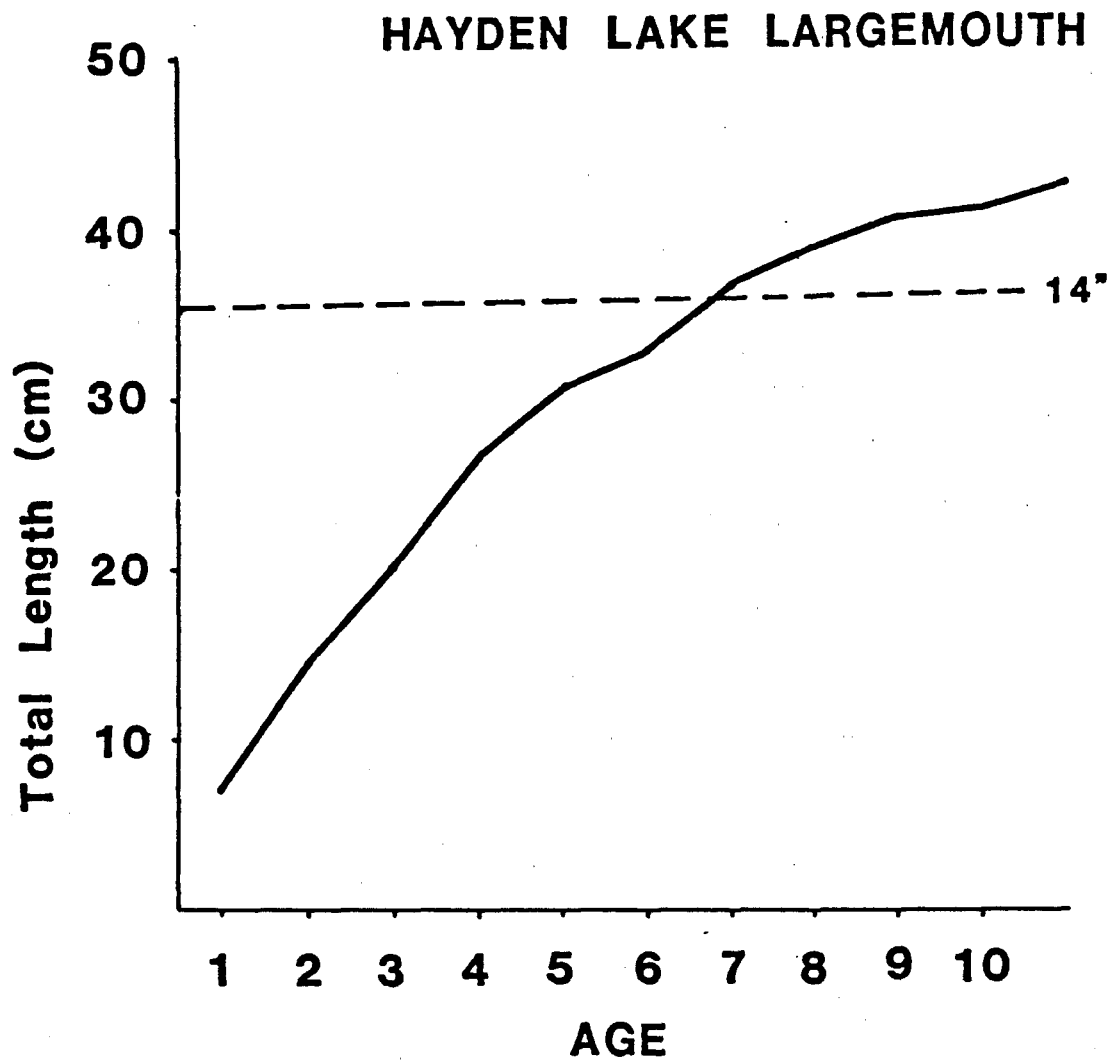


Figure 25. Documented growth of Hayden Lake largemouth bass, with reference to the 14-inch minimum size regulation on Hayden Lake, Idaho.

Trout management on Hayden Lake continued to emphasize the use of domestic Kamloops rainbow fingerlings and now more restrictive regulations to provide better than average angling for large trout. A two-fish daily bag limit was adopted for Hayden Lake for the 1988-1989 season. This change lowered the bag from three per day, but the existing 14-inch minimum was retained. Hatchery releases of rainbow in 1987 included 50,000 Mt. Lassen strain rainbow that were marked and 316,839 domestic Kamloops (Table 15). Mt. Lassen rainbow were larger than Kamloops at release and were fin clipped to evaluate their performance in the fishery.

Domestic Kamloops, wild rainbow and cutthroat trout all ate Mysis in Hayden Lake through the fishing season, providing excellent growth rates. Abundance of Mysis was estimated at 27/m³ in June 1987. Abundance at sampling stations ranged from 18.8 to 35.5/m³, with the average being similar to that estimated in 1985 (although 1985 data were expressed aerially). Abundance of Mysids should be monitored annually to better understand patterns of variation and how they relate to the fishery.

Two habitat improvement projects were completed for bass and crappie in Hayden Lake in 1987. A whole (15 m) tree structure was placed in of Windy Bay and the placement procedure worked well. The tree was suspended in the water column horizontally with concrete anchors and sealed plastic buckets as floats. Use of the structure will be evaluated, as will its longevity, and will be compared to that of Christmas tree clusters that were placed about 100 m away in Windy Bay. Local bass anglers collected and delivered approximately 70 Christmas trees that were wired in clusters of three and placed using concrete anchors. Use of the tree clusters will be evaluated and compared to that of whole trees.

The lowland lakes survey program continued in 1987, and fishery and limnological data were collected on seven and four lakes, respectively. To date, complete data have been collected on 27 lakes, and physical inventories have been done on 31 (Table 16).

Anderson Lake

Fish populations were sampled in Anderson Lake with experimental gill nets in 1987 (Figure 26). Although six species were sampled, the numbers caught were low and future evaluation should probably be conducted by electrofishing.

Bloom Lake

Gillnetting was conducted on Bloom Lake in 1987 and brook trout were the only species collected (Figure 27). Mean length of brook trout was 211 mm, and length ranged from 120 to 270 mm (Figure 28). Three age classes appear to be represented in the catch, although aging has not yet been completed.

Table 15. Number and average length of domestic Kamloops and wild Gerrard stock rainbow trout released into Hayden Lake, Idaho, 1983-1987. Length measurements were derived from a table that converts the number of fish per pound to average length.

Date	Number released	Average length (mm)	Comments
<u>1983</u>			
6/22/83	115,000	96	Trout Lodge Inc., WA -- egg take
8/5/83	<u>17,490</u>	89	both lots infected with IHN
	132,490		
10/4/83	51,450	157	Trout Lodge Inc., WA -- egg take
10/18/83	<u>44,100</u>	157	Trout Lodge Inc., WA -- egg take
	95,550		
TOTAL	228,040		
<u>1984</u>			
4/23 to 5/18/84	88,445	76	Gerrard stock from Pend Oreille Lake fish, stocked in Yellowbanks Creek for egg bank purposes
7/23/84	260,400	87	Trout Lodge Inc., WA -- egg take
TOTAL	348,845		
<u>1985</u>			
3/16/85	3,531	107	Gerrard stock from Pend Oreille Lake fish, stocked in Yellowbanks Creek for egg bank purposes
7/3/85	7,470	93	Trout Lodge Inc., WA -- egg take
7/8/85	4,565		Trout Lodge Inc., WA -- egg take
9/16/85	156,100		Trout Lodge Inc., WA -- egg take
TOTAL	171,166		

Table 15. Continued.

Date	Number released	Average length (mm)	Comments
<u>1986</u>			
5/28/86	81,000	96	Trout Lodge Inc., WA -- egg take
5/29/86	77,625	96	Trout Lodge Inc., WA -- egg take
8/7/86	24,335	134	Dunan R. Strain from Ennis NFH, Montana, hatched and reared at Hagerman SFH, Idaho
TOTAL	182,960		
<u>1987</u>			
4/23/87	50,000	144	Mt. Lassen stock rainbow
5/5/87	273,600	87	Trout Lodge Inc., WA -- egg take
9/9/87	43,239	81	Trout Lodge Inc., WA -- egg take
TOTAL	366,839		
GRAND TOTAL TO DATE	1,063,561		

Table 16. Physical, chemical, and potential limiting factors for salmonids in northern Idaho lowland lakes.

	Depth (m)		Conductivity ,		Secchi	Summer limitation factors for salmonids	
	X	(max)	UMHO/l	MFT	(m)	low O ₂	high temperature
Anderson Lake	3.7	(5.2)	79	3.62	2.4	moderate	moderate
Black	4.6	(6.0)	16	4.24	3.8	high	extreme
Blue	4.5	(6.4)	63	2.35	2.7	moderate	moderate
Blue (Priest R.)	3.4	(3.7)	54	2.68	2.5	low	extreme
Bonner	7.3	(20.0)	--	--	5.4	moderate	moderate
Brush	3.8	(5.5)	58	2.55	3.0	moderate	high
Bullrun	1.3	(2.5)	--	--	--	extreme	extreme
Chatcolet	3.4	(10.7)	51	2.50	3.8	moderate	high
Chase	2.4	(3.7)	35	2.46	2.5	low	extreme
Cocollala	8.0	(13.7)	64	1.35	3.0	moderate	moderate
Coeur d'Alene	24.3	(61.0)	50	0.35	4.0	low	low
Dawson	4.0	(5.5)	--	--	3.3	moderate	moderate
Fernan	3.0	(7.6)	39	2.19	3.6	low	extreme
Freeman	1.8	(5.5)	81	7.73	2.5	moderate	high
Gamble	4.1	(11.4)	110	4.51	4.5	high	extreme
Granite	20.8	(40.0)	235	1.91	4.5	high	extreme
Hauser	6.1	(12.2)	45	1.24	5.7	moderate	extreme
Hayden	46.2	(64.6)	60	0.22	8.1	low	low
Jewel	5.9	(10.5)	53	1.53	1.6	moderate	high
Kelso	7.7	(14.8)	97	2.14	5.8	moderate	moderate
McArthur	1.0	(3.0)	161	29.42	2.0	low	extreme
Mirror	15.9	(18.5)	69	0.73	7.0	moderate	low
Perkins	2.9	(4.5)	--	--	4.0	moderate	moderate
Rose	2.7	(5.2)	40	2.48	3.2	high	extreme
Round	5.7	(10.4)	69	2.06	2.5	moderate	low
Smith	7.0	(12.0)	104	2.53	3.8	moderate	low
Solomon	5.4	(7.0)	--	--	7.0	low	low
Spirit	10.5	(29.0)	28	0.46	3.6	moderate	low
Thompson	4.0	(7.0)	92	3.85	3.5	moderate	moderate
Lower Twin	4.6	(10.4)	23	0.84	5.3	moderate	moderate
Upper Twin	2.4	(5.0)	24	1.71	5.0	low	extreme

Anderson Lake

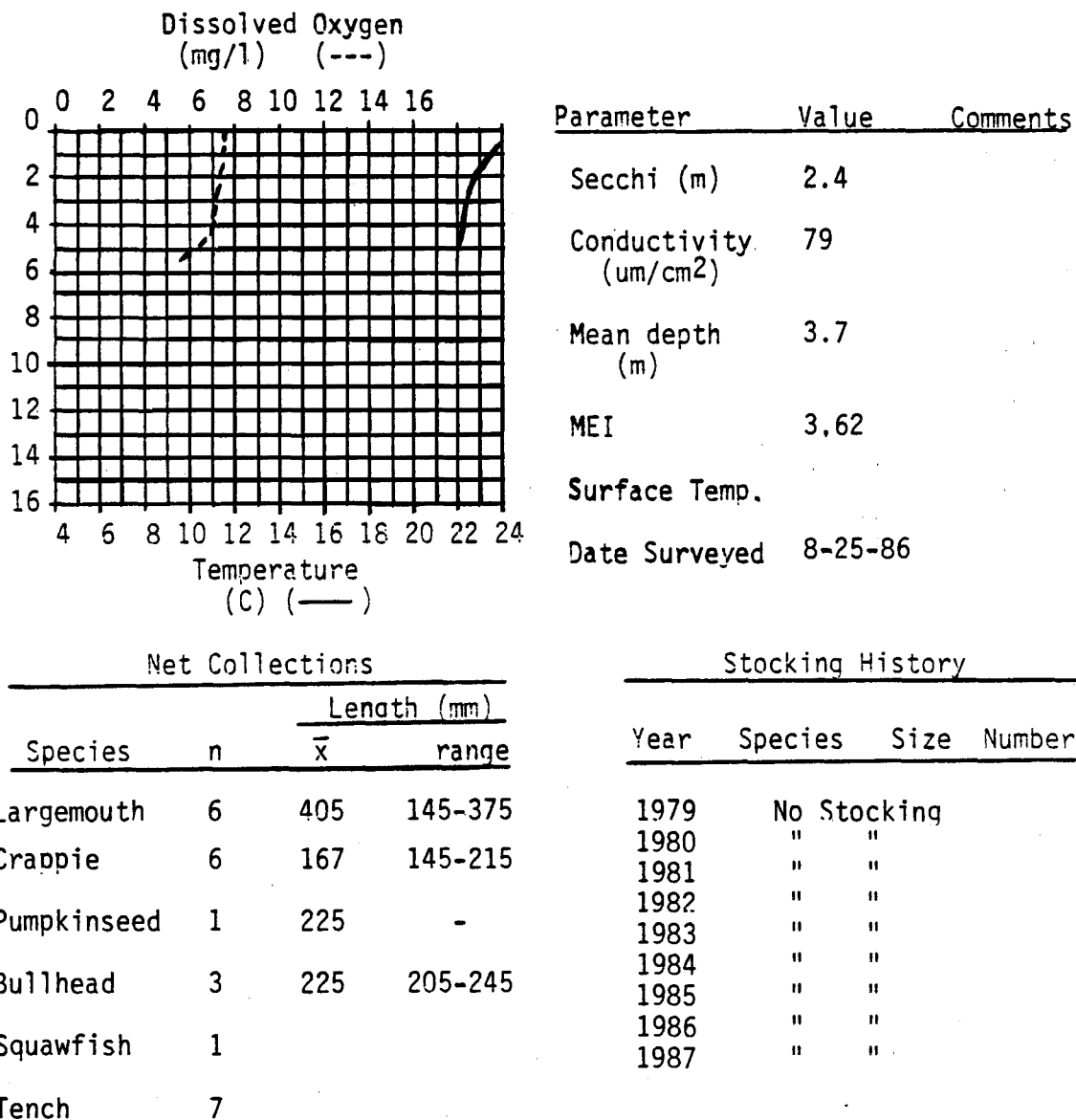
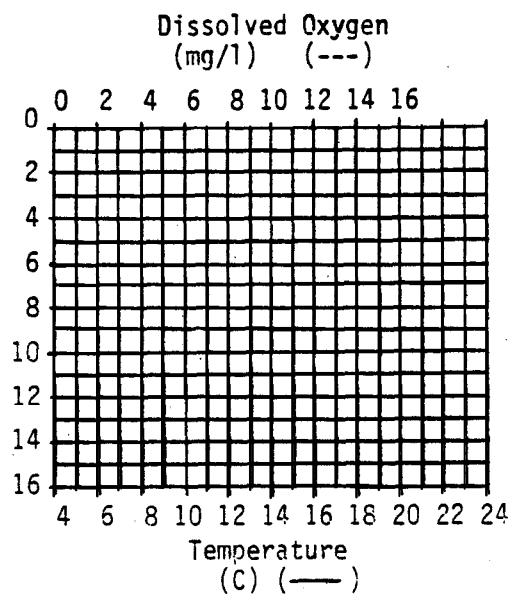


Figure 26. Limnological and biological parameters and stocking history of Anderson Lake, Kootenai County, Idaho.

Bloom Lake



Parameter	Value	Comments
Secchi (m)		
Conductivity (um/cm ²)		
Mean depth (m)		
MEI		
Surface Temp.		
Date Surveyed		

Net Collections			
Species	n	Length (mm)	
		\bar{x}	range
Brook Trout	50	211	125-275

Stocking History			
Year	Species	Size	Number
1970	BK	2	2,244
	BK	1	20,100
1971	BK	2	10,050
1972	CT	2	10,350
1973	BK	2	8,060
1974	No Stocking		
1975	BK	1	14,436
1976	BK	2	10,440
1977	BK	1	7,852
1978	BK	1	10,304
1979	No Stocking		
1980	CT	1	13,680
1981	BK	1	24,408
1982	BK	2	10,620
1983	No Stocking		
1984	BK	2	5,041
1985	BK	2	4,599
1986	BK	2	5,360
1987	BK	2	5,000

Figure 27. Limnological and biological parameters and stocking history of Bloom Lake, Bonner/Boundary counties, Idaho.

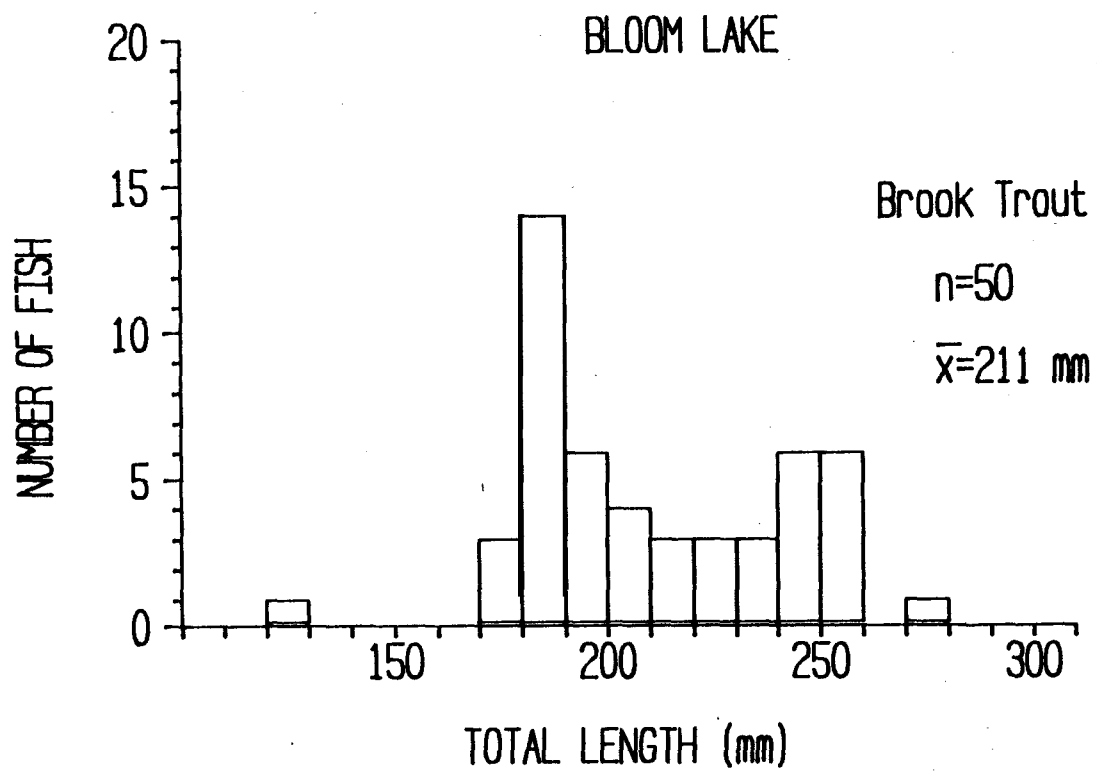


Figure 28. Length composition of brook trout collected by gill net in Bloom Lake, Bonner/Boundary counties, Idaho, 1987.

Blue Lake

Fish species composition was assessed in Blue Lake (Spokane River drainage) by gillnetting in 1987 (Figure 29). Five species were collected, but as on Anderson, catch was too low to describe characteristics of each population. Composition might be more adequately sampled by electrofishing or additional gillnetting, or both.

Bonner Lake

Limnological characteristics of Bonner Lake were surveyed in 1987 in evaluating fish habitat suitability. Mean depth was virtually identical to the average for all lakes surveyed at 7.3 m, but transparency (Secchi) was greater than the overall mean of 4 m (Figure 30). Oxygen and temperature conditions are moderate for salmonid production. Conductivity was not measured, so MEI will have to be calculated when the datum is available.

The fishery on Bonner Lake is not producing at potential and is being considered for rehabilitation or new species introductions in the fall of 1988. The volume was calculated at 657,719 m³ and at a treatment rate of 1.23 mg/I would require 809 kg of 5% rotenone. Reclamation scheduling will be somewhat dependent upon rotenone availability, which is now limited. Bonner seems suitable for development of a two-story fishery using salmonids and warmwater species compatible with the Kootenai drainage. The lake is steep sided in the central basin, but has more extensive littoral areas on each end. Limited kokanee stocking would also diversify the fishery.

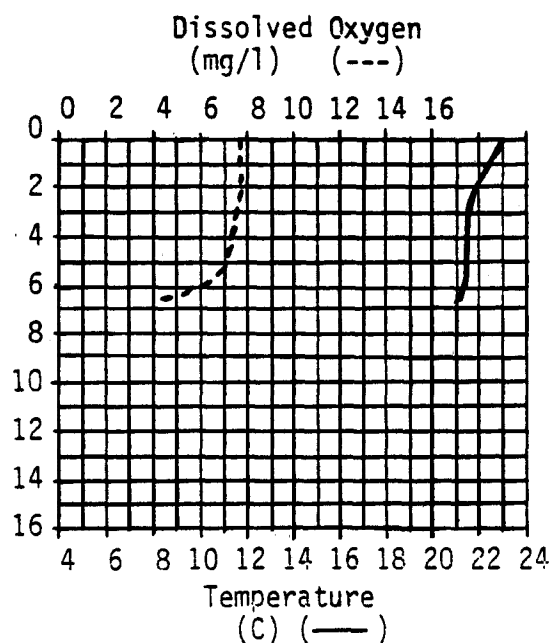
Chase Lake

Fish populations were sampled in Chase Lake with experimental gill nets in 1987 (Figure 31). Mean length of largemouth was relatively short and the range did not extend markedly beyond the 12-inch minimum size. Growth of Chase largemouth should possibly be evaluated to determine appropriateness of the minimum size. Mean length of yellow perch was substantially greater than that for most lowland lakes and should provide an excellent fishery for larger fish (Figure 32). Persistent complaints of "wormy" fish in Chase Lake concern anglers.

Dawson Lake

Limnological characteristics of Dawson Lake were surveyed in 1987 to evaluate summer habitat conditions (Figure 33). Mean depth was nearly 4 m, and transparency (Secchi) was below the overall mean for all lakes surveyed. Temperature and oxygen limitations for fish are moderate, and Dawson does support popular fisheries for largemouth, crappie, and bullhead. Conductivity was not measured in 1987, so MEI will have to be calculated when that datum is available.

Blue Lake



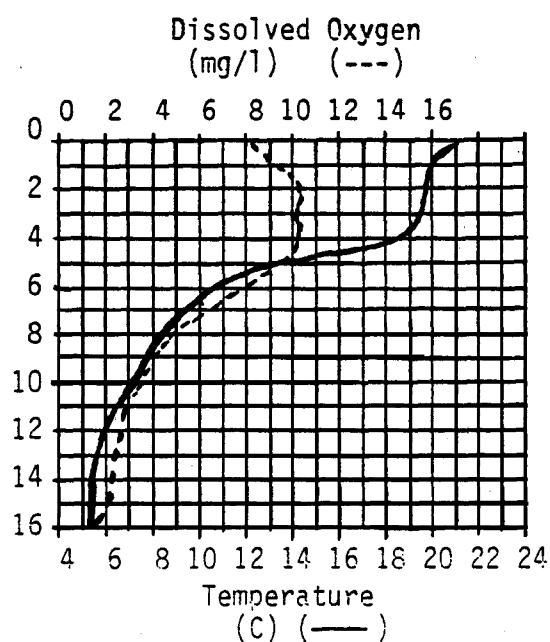
Parameter	Value	Comments
Secchi (m)	2.7	
Conductivity (um/cm ²)	63.3	
Mean depth (m)	4.5	
MEI	2.35	
Surface Temp.		
Date Surveyed	8-25-86	

Net Collections			
Species	n	Length (mm)	
		\bar{x}	range
Largemouth	8	329	115-425
Black Crappie	2	165	115-215
Blk Bullhead	1	145	-
Tench	3	-	-
Squawfish	1	-	-

Stocking History			
Year	Species	Size	Number
1979	No Stocking		
1980	"	"	"
1981	"	"	"
1982	"	"	"
1983	"	"	"
1984	"	"	"
1985	"	"	"
1986	"	"	"
1987	"	"	"

Figure 29. Limnological and biological parameters and stocking history of Blue Lake, Kootenai County, Idaho.

Bonner Lake



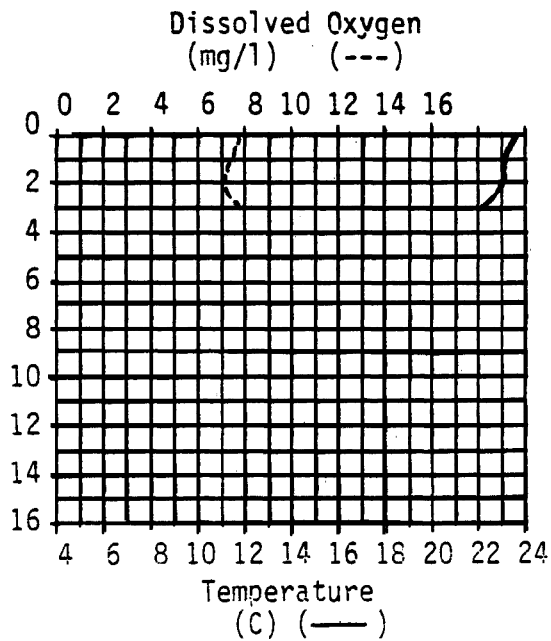
Parameter	Value	Comments
Secchi (m)	5.4	
Conductivity (um/cm ²)	-	
Mean depth (m)	7.26	
MEI	-	
Surface Temp.		
Date Surveyed		

Net Collections			
Species	n	Length (mm)	
		\bar{x}	range
Pumpkinseed	46	114	102-131
Hatchery R1	32	--	---

Stocking History			
Year	Species	Size	Number
1979	RB	3	3,807
	KM	1	5,080
1980	RB	3	4,130
1981	RB	3	4,755
1982	R1	3	3,180
1983	R1	3	1,505
1984	R1	3	3,020
1985	R1	3	2,962
1986	R1	3	2,015
1987	R4	3	1,000
	R4	3	3,019

Figure 30. Limnological and biological parameters and stocking history of Bonner Lake, Bonner County, Idaho.

Chase Lake



Parameter	Value	Comments
Secchi (m)	2.5	
Conductivity (um/cm ²)	35	
Mean depth (m)	2.4	
MEI	2.46	
Surface Temp.	23.2	
Date Surveyed	8-13-84	

Net Collections			
Species	n	Length (mm)	
		\bar{x}	range
Largemouth	10	247	205-325
Pumpkinseed	7	178	105-215
Blk Bullhead	3	302	235-355
Yellow Perch	85	223	175-295

Stocking History			
Year	Species	Size	Number
1979	No Stocking		
1980	"	"	"
1981	"	"	"
1982	"	"	"
1983	"	"	"
1984	"	"	"
1985	"	"	"
1986	"	"	"
1987	"	"	"

Figure 31. Limnological and biological parameters and stocking history of Chase Lake, Boundary County, Idaho.

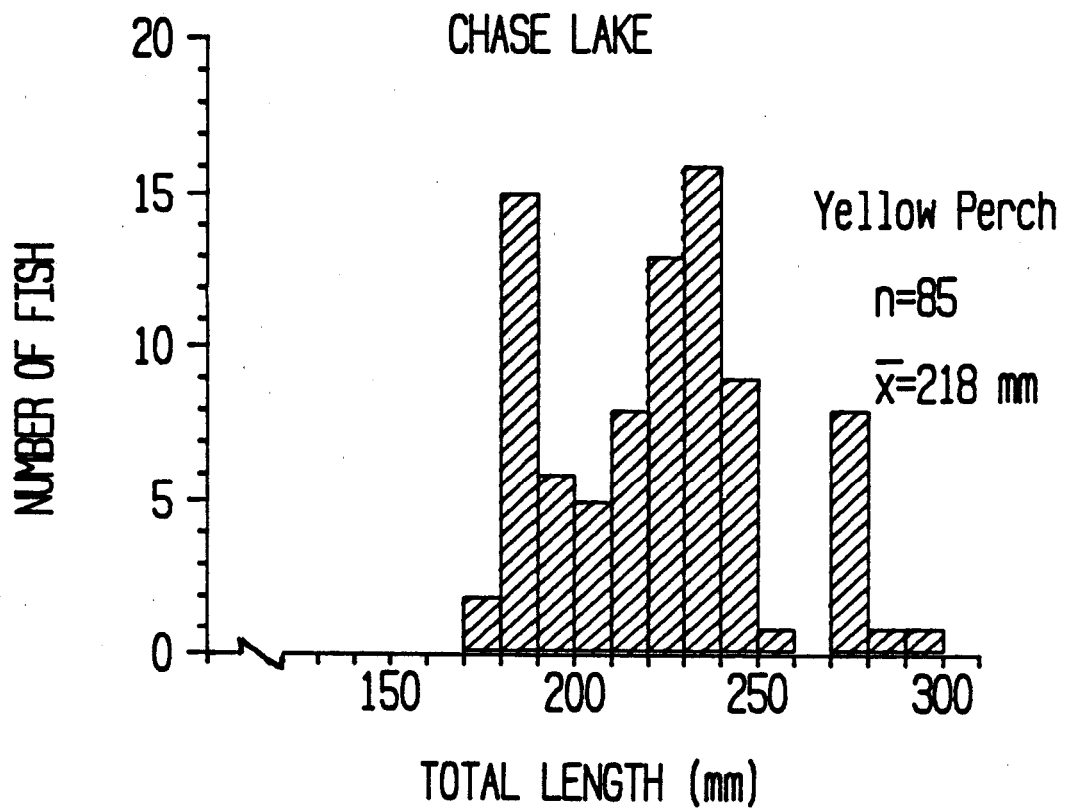
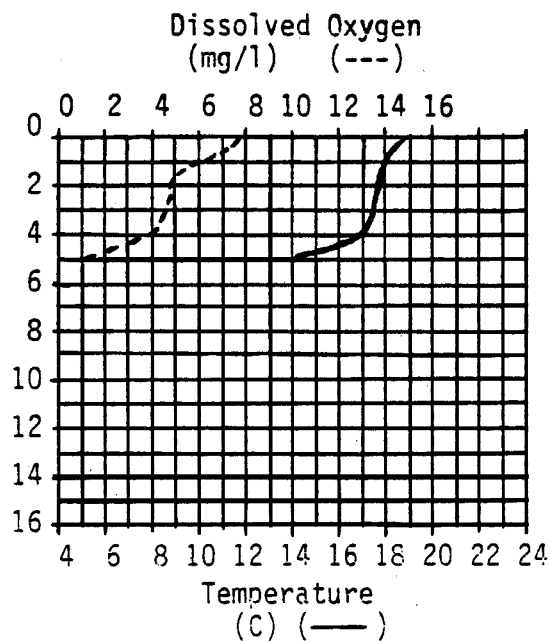


Figure 32. Length composition of yellow perch collected by gill net, Chase Lake, Boundary County, Idaho, 1987.

Dawson Lake



Parameter	Value	Comments
Secchi (m)	3.25	
Conductivity (um/cm2)	-	
Mean depth (m)	3.97	
MEI	-	
Surface Temp.		
Date Surveyed		

Net Collections			
Species	n	Length (mm)	
		\bar{x}	range
Bullhead	34	253	199-277
Perch	14	190	173-208
Bluegill	1	71	71
Crappie	11	204	155-260
Largemouth	5	272	182-355

Stocking History			
Year	Species	Size	Number
1979	No Stocking		
1980	"	"	
1981	"	"	
1982	"	"	
1983	"	"	
1984	"	"	
1985	"	"	
1986	"	"	
1987	"	"	

Figure 33. Limnological and biological parameters and stocking history of Dawson Lake, Bonner County, Idaho.

Freeman Lake

Gillnetting was conducted on Freeman Lake in 1987 to evaluate composition of the fish community (Figure 34). Length data on largemouth bass indicates that growth is probably good and that the 12-inch minimum size is appropriate. Yellow perch were abundant in the catch and their length was representative of typical perch populations throughout the region (Figure 35). Only one northern pike was caught, but their presence in the fishery should be monitored. The performance of pike in Freeman Lake might give an indication of what type of fisheries they could provide in other similar lowland lakes.

Perkins Lake

Both limnological and fishery characteristics of Perkins Lake were evaluated in 1987 (Figure 36). Mean depth was nearly 3 m and relative transparency was moderate at 4 m. Oxygen and temperature conditions are moderate for warmwater fisheries, but would probably be unsuitable to salmonids. Conductivity was not measured, so MEI will have to be calculated when the datum is available.

Fish populations were sampled with experimental gill nets and relatively low numbers were collected. Mean length of largemouth bass was relatively small and the range did not reach the 12-inch minimum size harvest limit (Figure 37). It is unknown whether angling pressure is limiting mean size, if growth rates are low and the limit is inappropriate, or if the sample is too small to be representative. Status of largemouth should probably be evaluated from samples collected by electrofishing. Mean sizes of pumpkinseeds and black crappie were quite good in comparison to those of other lakes.

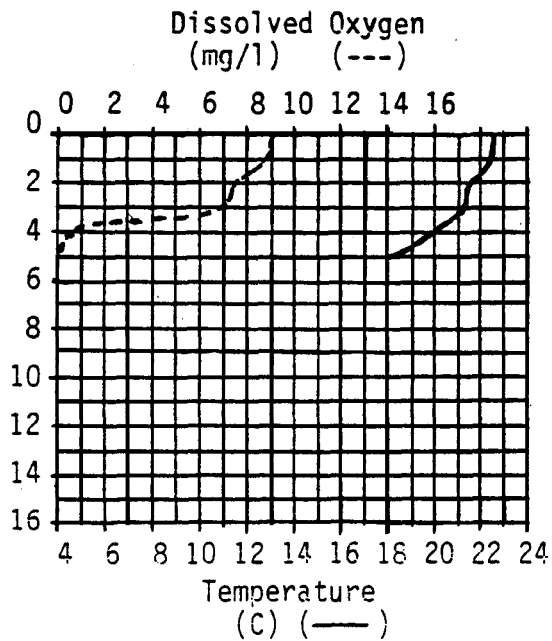
Solomon Lake

Limnological characteristics of Solomon Lake were surveyed in 1987, and the lake was quite different from other lowland lakes of the region (Figure 38). Transparency was outstanding and equaled the maximum depth of 7 m. Of all lakes surveyed, Secchi depth was exceeded only on Hayden and Mirror (much deeper lakes). Oxygen was at saturation nearly throughout the water column, with a prominent metalimnetic maxima at 6 m and a slight depression at the bottom. Temperature, oxygen, and transparency values all reflected the alpine character of this lake. Conductivity was not measured, so MEI will have to be calculated when the datum is available.

Thompson Lake

Fish populations of Thompson lake were sampled with gill nets in 1987 to evaluate species composition (Figure 39). Overall catch was low, and better information might be gained through electrofishing or more intensive netting. Yellow perch were quite small compared to those in other lakes surveyed in 1987. Evaluation of growth of other species should be based on a more adequate sample size.

Freeman Lake



Parameter	Value	Comments
Secchi (m)	2.5	
Conductivity (um/cm ²)	81	
Mean depth (m)	1.8	
MEI	7.73	
Surface Temp.	22.3	
Date Surveyed	8-13-84	

Net Collections			
Species	n	Length (mm)	
		\bar{x}	range
Largemouth	7	261	195-435
Yellow Perch	67	194	175-215
Pumpkinseed	3	178	175-185
Northern Pike	1	540	-
Hatchery R1	9	-	-
Tench	20	-	-

Stocking History			
Year	Species	Size	Number
1985	R1	3	5,722
1986	R1	3	2,007
	R4	3	2,050
1987	R4	3	4,007

Figure 34. Limnological and biological parameters and stocking history of Freeman Lake, Bonner County, Idaho.

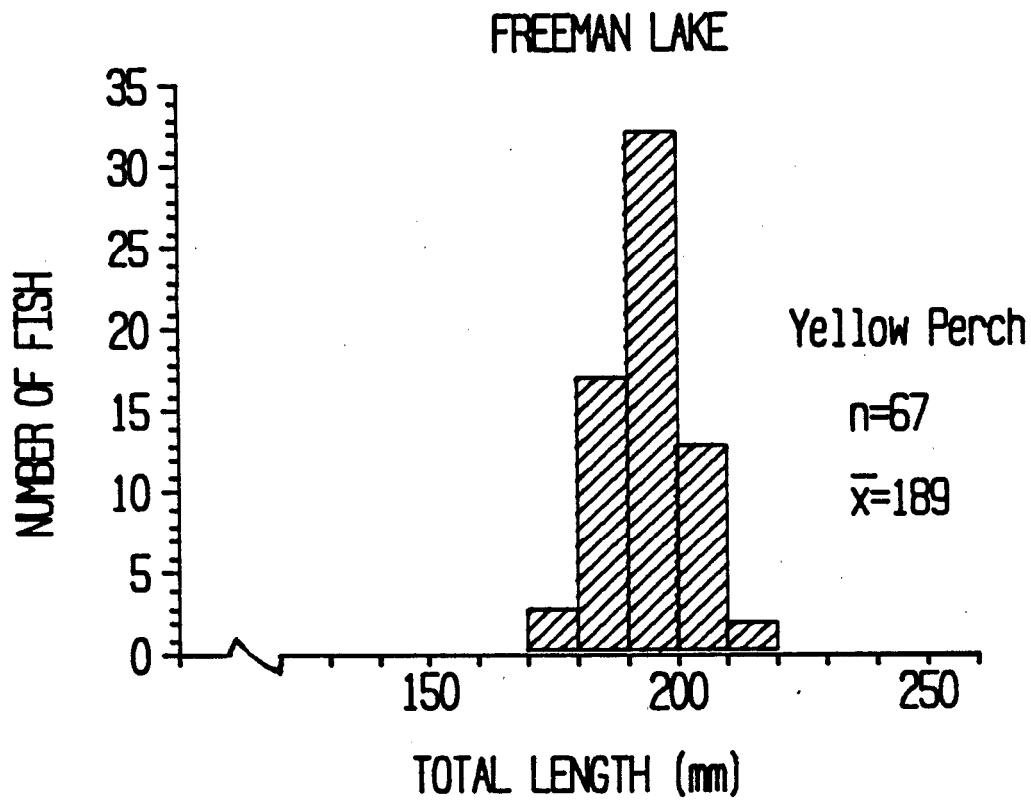
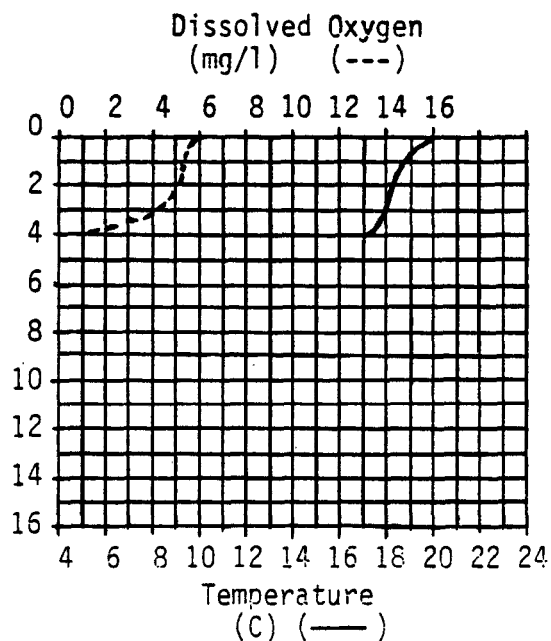


Figure 35. Length frequency of yellow perch collected in Freeman Lake, Bonner County, Idaho, 1987.

Perkins Lake



Parameter	Value	Comments
Secchi (m)	4.0	
Conductivity (um/cm ²)	-	
Mean depth (m)	2.88	
MEI	-	
Surface Temp.	19.4	
Date Surveyed	8-17-87	

Net Collections			
Species	n	Length (mm)	
		\bar{x}	range
Largemouth	13	225	165-285
Pumpkinseed	5	193	185-215
Black Crappie	8	219	195-265
Bullhead	1	265	-

Stocking History			
Year	Species	Size	Number
1982	BK	2	4,720
1983	No Stocking		
1984	BK	2	4,402
1985	BK	2	6,509
1986	BK	2	5,968
1987	BK	2	6,000

Figure 36. Limnological and biological parameters and stocking history of Perkins Lake, Boundary County, Idaho.

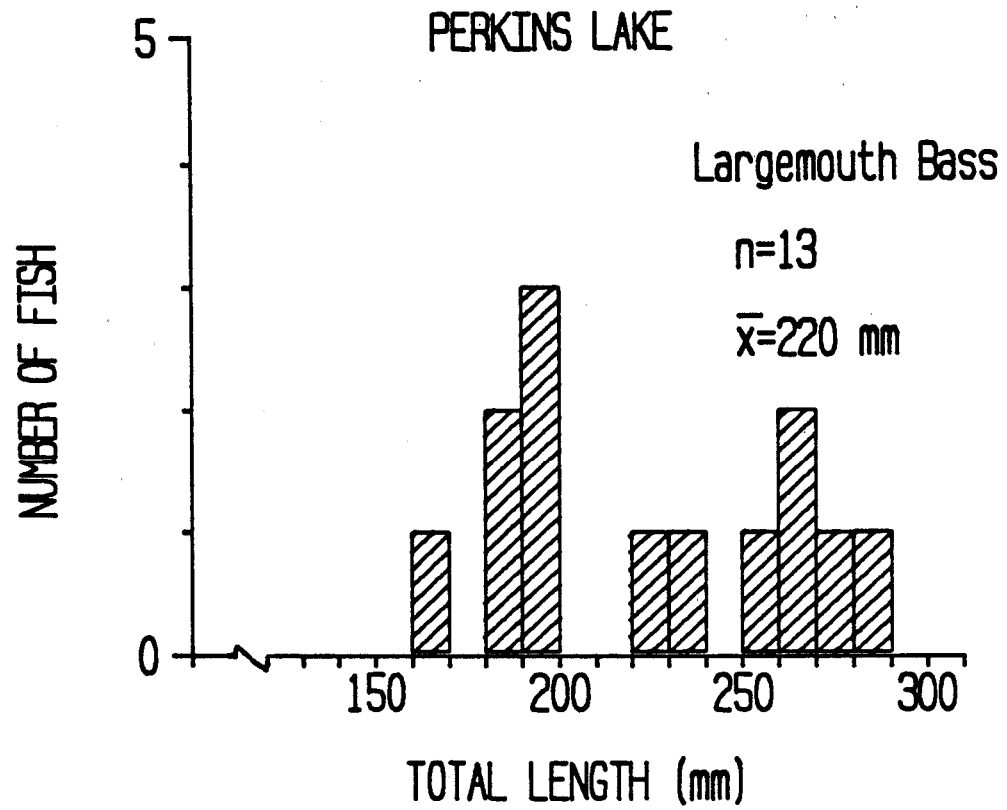
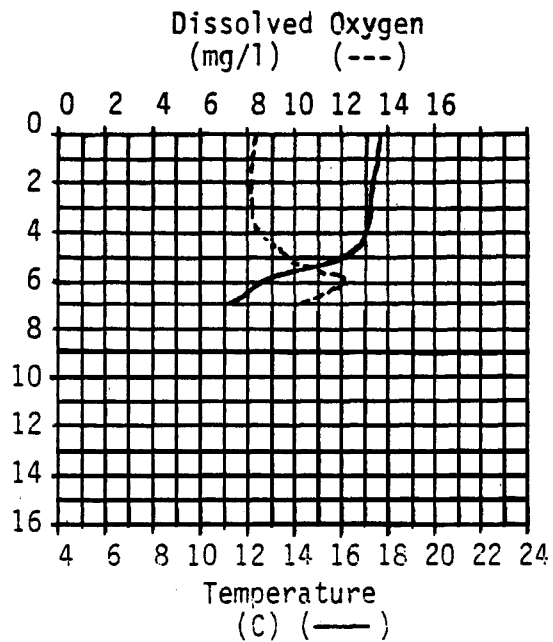


Figure 37. Length composition of largemouth bass collected by gill net in Perkins Lake, Boundary County, Idaho.

Solomon Lake



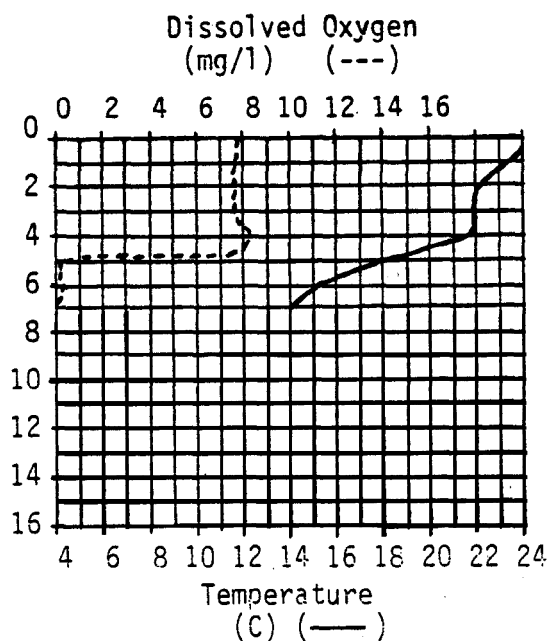
Parameter	Value	Comments
Secchi (m)	7.0	on bottom
Conductivity (um/cm ²)	-	
Mean depth (m)	5.36	
MEI	-	
Surface Temp.	17.6	
Date Surveyed	8-18-87	

Net Collections			
Species	n	Length (mm)	
		\bar{x}	range
Cutthroat	15	230	156-385

Stocking History			
Year	Species	Size	Number
1979	KM	1	5,062
1980	No Stocking		
1981	"	"	
1982	KM	1	3,040
1983	C3	1	2,162
1984	K1	1	2,268
1985	No Stocking		
1986	C2	1	2,500
1987	No Stocking		

Figure 38. Limnological and biological parameters and stocking history of Solomon Lake, Bonner County, Idaho.

Thompson Lake



Parameter	Value	Comments
Secchi (m)	3.5	
Conductivity (um/cm ²)	92	
Mean depth (m)	4.0	
MEI	3.85	
Surface Temp.		
Date Surveyed	8-23-86	

Net Collections			
Species	n	Length (mm)	
		\bar{x}	range
Largemouth	1	305	-
Black Crappie	5	215	145-255
Yellow Perch	17	167	135-235
Kokanee	1	235	-
Northern Pike	2	528	475-580
No. Squawfish	3	-	-
Tench	3	-	-

Stocking History			
Year	Species	Size	Number
1979	No Stocking		
1980	"	"	
1981	"	"	
1982	"	"	
1983	"	"	
1984	"	"	
1985	"	"	
1986	"	"	
1987	"	"	

Figure 39. Limnological and biological parameters and stocking history of Thompson Lake, Kootenai County, Idaho.

Jewell Lake

Jewell Lake is not supporting fisheries at its potential, nor are they consistent with what has been produced in the past. The lake has been scheduled for reclamation in the fall of 1988, depending upon rotenone availability. Volume of Jewell was calculated at 516,952 m³ and would require 636 kg of 5% rotenone to meet the target application rate of 1.23 mg/l. Jewell Lake once supported outstanding cutthroat fishing and has produced kokanee weighing up to 1.82 kg (4 pounds). These species have the potential to produce a quality salmonid fishery if the lake is rehabilitated by removing stunted yellow perch.

Sinclair Lake

Sinclair Lake supports a monospecific fishery of severely stunted yellow perch. The lake has been scheduled for rehabilitation in the fall of 1988, and because of its small size, will probably be stocked with catchable rainbow. There is a need for more lake fishing opportunity in the extreme north of the region and catchable rainbow should help meet that need.

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JOB PERFORMANCE REPORT

State of: Idaho Project

Name: REGIONAL FISHERY MANAGEMENT
INVESTIGATIONS

No.: F-71-R-12

Title: Region 1 River and Stream
Investigations

Job No.: 1-c

Period Covered: July 1, 1987 to June 30, 1988

ABSTRACT

The routine officer creel census was continued in 1987 to provide information on fishing effort and harvest throughout the region. The hatchery catchable rainbow trout program was also evaluated, using officer creel census and tag return data. It appeared that Hayspur and Mt. Lassen stock rainbow trout provide better return to the creel than other rainbow stocks. We may be able to provide a better fishery in northern Idaho streams using these stocks of fish.

An evaluation of the lower Spokane River trout population was completed in 1987. The washout of Upriver Dam in May 1986 and subsequent dewatering of the river between Post Falls Dam and Upriver Dam, resulted in poor survival of the 1986 year class. Age 1 fish represented less than 25% of the sample collected in June 1987 as opposed to 41% and 35% in June 1985 and 1986, respectively. It appears a minimum flow of 6,000 cfs (170 m³) from April 1 to June 30 would protect approximately 65% of spawning and incubation habitat. A spawning closure from March 1 to the general stream opener was implemented to protect vulnerable spawning adults.

Numbers of kokanee spawners in selected tributaries of the Kootenai River declined significantly from the 1986 estimate. An estimated 356 kokanee spawned in four tributaries (Boundary, Long Canyon, Parker, and Smith creeks). Counts again were made in early September 1987 and may have missed the peak of the spawning activity. The lack of fish in Boundary Creek may be a result of overexploitation or a weak year class in the population.

Data to establish a staff gauge-discharge relationship for Grouse and Lightning creeks were collected in 1987. Lightning Creek from Cascade to Spring creeks flowed subsurface during most of the summer and fall. Discharge measurements collected in 1987 probably do not accurately reflect flows from the entire Lightning Creek drainage. Additional transects upstream from Cascade Creek will be established in 1988 to better determine instream flows in Lightning Creek. Two additional streams (North Fork Grouse and Trestle creeks) were proposed for minimum instream flow requests in 1987, but data were not collected. These streams will be evaluated in 1988.

A project initiated in 1986 to evaluate quality and quantity of habitat and status of fish populations in selected tributaries of the lower Priest River was completed in 1987. Data on habitat components, species composition, relative abundance, and age and growth characteristics were collected from six streams. Habitat quality generally was better in tributaries surveyed in 1987 as compared to those surveyed in 1986. Moores and Quartz creeks support good populations of brook trout. Cutthroat and brown trout were collected from Quartz Creek. Lack of older age fish and high catch rates (2.5 fish/hour) could indicate overexploitation of brook trout in Moores Creek.

Evaluation of the catch-and-release regulations on the upper Coeur d'Alene River indicated overall abundance of westslope cutthroat trout has increased two- to fivefold. The percentage of large (>300 mm) cutthroat in the sample did not change significantly from 1980-1981 to 1987. The lack of large fish may indicate noncompliance with regulations. Habitat degradation and overharvest of immature fish in the lower river during spring has contributed to the slow recovery of the cutthroat population. Regulation changes would further restrict harvest of cutthroat in the Coeur d'Alene system and should increase spawner escapement to seed available habitat and provide better angling opportunities in the future. A major informational and educational effort is planned to ensure anglers are informed of the reasons for the regulations and the existence of alternative angling opportunities.

Evaluation of the success of brown trout introductions were conducted in July 1987. Data were collected on habitat quality and quantity, species composition, relative abundance, distribution, and age growth characteristics. Few brown trout (43 in Hoodoo Creek and 6 in Cocolalla Creek) were observed or collected. Densities of brook and rainbow trout were very high and competition with these species may have reduced survival of the brown trout. It may be that brown trout are sufficiently stressed by transportation and are suffering high postrelease mortality. Stocking larger fish (fingerling or catchable size) may improve survival of brown trout in Hoodoo and Cocolalla creeks.

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OBJECTIVES

1. To determine relative abundance, density, and age and growth characteristics of wild and hatchery stocks of trout in streams.
2. To determine availability and quality of spawning and rearing habitat and existing and potential use of habitat by trout.
3. To determine instream flow requirements for trout.
4. To determine impacts of land use activities on fish populations and stream habitat.

RECOMMENDATIONS

1. Use catchable trout stocking rates of 150 to 300 fish/km on stream systems where wild recruitment is limited or nonexistent.
2. Continue to explore with Washington Water Power Company the feasibility of maintaining a minimum flow of 6,000 cfs (170 m³) in the Spokane River below Post Falls Dam. A minimum flow from April 1 to June 30 would protect critical rainbow trout spawning and incubation habitat.
3. Evaluate the success of brown trout introductions in the Spokane River below Post Falls Dam and Priest River below Priest Lake.
4. Educate the local angling public to the fishing opportunities that exist for brook and cutthroat trout in many of the lower Priest River tributaries. Attempt to shift some of the fishing pressure from Moores Creek to other tributaries, as the brook trout population in Moores Creek appears to be overexploited.
5. Evaluate the effectiveness of new cutthroat trout regulations and collect trend data in the Spokane River drainage using creel surveys and snorkeling. Implement a major educational and informational effort to ensure anglers are informed of the reason for regulation changes and alternative angling opportunities in the same areas.
6. Continue to stock brown trout in Hoodoo and Cocolalla creeks. Pursue the feasibility of stocking fingerling or catchable size brown trout.

TECHNIQUES AND FINDINGS

Routine Census

Routine creel census data collection by Region 1 conservation officers continued in 1987. Officers collected data on the Moyie, North Fork Coeur d'Alene, and Spokane rivers and on Teepee and Trestle creeks. Estimated fishing effort ranged from 92 hours/km on the North Fork Coeur d'Alene River to 3,070 hours/km on the Spokane River (Table 1). Effort was lower in 1987 on most censused streams than in previous years, with the exception of the Spokane River. Effort on the Spokane has nearly tripled since 1981, but catch rates have not changed significantly (0.12 to 0.20 fish/hour). Angler effort on Teepee Creek and the North Fork Coeur d'Alene River has declined drastically since 1985. Low effort and catch rates on the North Fork Coeur d'Alene likely result from declining quality rearing habitat for cutthroat trout and poor embryo survival (Gamblin 1986).

The Department and the US Forest Service have recognized the need to protect and enhance the cutthroat population in the North Fork drainage. We have adopted restrictive regulations (catch-and-release) on the upper North Fork to increase spawning escapement and resulting recruitment. The Forest Service has constructed numerous habitat improvement structures to improve instream cover and provide additional rearing space.

Catch rates on the Moyie River exceeded goals (0.50 fish/hour) outlined in the 1986-1990 Fisheries Management Plan. Goals for the North Fork Coeur d'Alene River were not met for reasons previously explained. Catch rates on Teepee Creek appeared to increase substantially from 1986 (Table 1) and may indicate recovery of the cutthroat population resulting from implementation of catch-and-release regulations. These data need to be viewed cautiously, however, as they are based on a limited number of interviews and on anglers' recollection of how many fish they caught and released. Trestle Creek supports low catch rates for wild rainbow trout and only moderate catch rates for cutthroat trout. The stream is one of the most important nursery tributaries for bull trout for Lake Pend Oreille and has been closed to all fishing during the, 1988-1989 season.

No specific streams were targeted for priority water creel census in 1988. Changes in fishing regulations for cutthroat trout necessitate increased enforcement efforts on the Coeur d'Alene and St. Joe rivers to ensure angler compliance.

Catchable Rainbow Trout Program Evaluation

We continued to use conservation officer census and tag return data to evaluate the catchable trout program in Region 1 rivers and streams. Returns from tagging data were corrected for the noncompliance bias using reward tags as described by Rieman (1984). Estimates of noncompliance ranged from 40% to 88% for waters evaluated from 1984 to 1987. Estimated return of catchable rainbow trout to the creel ranged from 2% to 47% (Table 2). The Moyie River was the only stream evaluated in 1987.

Table 1. Routine creel census data collected on Region 1, northern Idaho, rivers and streams during 1984-1987.

River		No. anglers interviewed	Km in section	X anglers	X anglers	Est. total	Est. hours	Catch rate fish/hour				
					Km	hours	Km	HRB	WRB	CT	BRN	Total
Moyie	(1987)	49	16	4	0.25	4,200	263	0.31	0.23	0.02	--	0.56
	(1984)	--	16	--	--	5,000	312	0.40	--	--	--	0.40
North Fork												
Coeur d'Alene (special regulation)	(1987)	35	24	3	0.13	2,200	92	--	--	0.03	--	0.03
	(1986)	73	24	8	0.25	3,010	125	--	0.01	0.12	--	0.13
	(1985)	63	24	6	0.17	7,157	298	--	--	0.20	--	0.20
Spokane (Post Falls to WA/ID border)	(1987)	252	9	10	1.11	27,600	3,070	--	0.10	--	0.02	0.12
	(1984)	181	9	--	--	--	--	--	0.20	--	--	0.20
	(1981)	--	--	--	--	10,000	1,086	--	0.15	--	--	0.15
Teepee Creek	(1987)	30	8	3	0.38	2,500	313	--	--	0.50	--	1.50 ^a
	(1986)	87	8	5	0.62	5,250	656	--	--	0.80	--	0.80
	(1985)	44	8	3	0.38	5,368	671	--	--	--	--	--
Trestle Creek	(1987)	68	10	3	0.30	4,000	400	--	0.09	0.20	--	0.29
	(1985)	29	10	2	0.20	--	--	--	--	0.08	--	0.08

^a Limited data.

Table 2. Catchable trout stocking rates, catch rates, and percent return to the creel for rivers and streams in northern Idaho, 1984-1987.

River	Year	km	Stocking density fish/km	Stock of fish ^a	Estimated percent return	Catch rate	Fishing pressure (hrs/km)	Total hours
Coeur d'Alene	1987	64	229	R4,R9	--	--	--	--
	1986	64	192	R1,R4,R9	--	0.08	463	29,660
	1985	54	287	R1	14	0.29	265	14,310
	1984	54	256	R1	--	0.35	530	36,000
South Fork	1987	19	213	R4,R9	--	--	--	--
Coeur d'Alene	1986	19	220	R1,R9	--	0.35	69	1,310
	1985	19	215	R1		0.79	377	7,150
	1984	19	375	R1	8	0.73		--
North Fork Coeur d'Alene	1987	19	318	R4,R9				
	1986	19	316	R1,R9		1.16	507	9,640
	1985	19	316	R1	10			--
	1984	19	313	R1				
St. Joe	1987	57	199	R4,R9				
	1986	57	159	R1,R4,R9		0.12	190	10,820
	1985	60	159	R1	28	0.51	209	12,525
	1984	64	144	R1		0.21	282	14,000
North Fork St. Joe	1987	35	172	R4,R9				
	1986	35	275	R1,R9	46	0.10	275	9,630
	1985	35	161	R1		0.43	256	8,950
	1984	35	263	R1				
Priest	1987	48	253	R4				
	1986	48	251	R1,R4,R9		0.70	83	3,980
	1985	48	249	R1			149	7,160
	1984	48	413	R1	3			
Marble Creek	1987	19	105	R9				
	1986	19	110	R1,R9 ^b	47			
	1984	19	50	R1		0.21	1,462	23,400
St. Maries	1987	42	168	R4,R9				
	1985	42	168	R1		0.88	256	10,740
	1984	42	206	R1	22	0.50		--
Pend Oreille	1985	42	238	R1	2			
Moyle	1987	16	516	R4	42	0.31	263	4,200
	1986	16	373	R1,R4				
	1985	15	588	R1,R3				
	1984	16	621	R1		0.50	312	5,000

^aR1=unspecified stock, R3=Kootenai stock, R4=Mt. Lassen stock, and R9=Hayspur stock.

^bFish used to estimate percent return to creel were Hayspur stock rainbow.

Catch rates supported by hatchery rainbow trout in the Moyie River was moderate (0.31 fish/hour) and return to the creel was good (42Z). This may be a reflection of the strain of fish stocked. We stocked Mt. Lassen rainbow in the Moyie River in 1987 and they returned at a significantly greater rate than the R1 (unspecified) rainbow stocked in other Region 1 streams. The rate of return to the creel was comparable to return rates for Hayspur strain rainbow stocked in Marble Creek and the North Fork St. Joe River in 1986. We did not stock any R1 rainbow in Region 1 streams in 1987 and recommend we stock only Hayspur or Mt. Lassen rainbow in the future.

It appears we are providing catch rates of approximately 0.3 to 0.5 fish per hour with stocking rates of 150 to 300 fish per kilometer on most northern Idaho streams. Additional evaluation of the performance of various strains of rainbow trout in northern, Idaho streams is needed to most effectively utilize the limited resource.

Additional data on return to the creel, angler effort, and catch rates on streams stocked with catchable rainbow trout will be collected on a random basis in 1988.

Spokane River

The fishery of the lower Spokane River from Post Falls Dam downstream to the Idaho state line (about 10 km) is supported by a natural rainbow trout population. This fishery has been managed as a year-round, high-yield urban fishery without supplemental stocking. The lower Spokane River rainbow appear to be unique in their ability to support this type of fishery, despite major flow fluctuations from power generation and seasonally poor water conditions.

A graduate student project undertaken in 1985 and 1986 determined that the Spokane River rainbow are main channel spawners restricted to relatively few areas (Bennett and Underwood 1988). Low flows and high summertime water temperatures are suspected of causing high postspawning mortality. Water fluctuations during incubation and hatching result in large variations in year-class strength. In May 1986, a power outage at Upriver Dam in Spokane, Washington, resulted in the failure of the spill gates to open and a washout of the dam. To compensate, spill gates at Post Falls Dam were closed and flows in the river dropped from 8,120 cfs [230 to 424 cfs (12 m³/s)] over a three-day period. Such dewatering of redds can cause substantial mortality to pre-emergent fry (Becker et al. 1983).

On June 4, 1987, we sampled the river to determine the subsequent impact of the Upriver Dam power failure on trout numbers, specifically age 1 rainbow. We electrofished the river between Post Falls Dam and the Idaho state line from a drift boat. Fish were anesthetized, identified to species, and total lengths (to the nearest mm) were recorded.

The average back-calculated lengths-at-age for age 1 rainbow trout in 1985 and 1986 were 176 and 159 mm, respectively (Table 3) and most age 1 fish appeared to be less than 220 mm in length. Using 220 mm as an arbitrary cutoff, approximately 41% and 35% of the rainbow collected in 1985 and 1986, respectively, were age 1. fish (Figure 1). In 1987, <25% of the fish sampled were less than 220 mm long (age 1), indicating poor survival of the 1986 year class.

Bennett and Underwood (1988) indicated the Spokane River provided a moderately productive rainbow trout fishery and produced some fish greater than 500 mm. However, annual mortality was high (approximately 76%) so few fish survived to attain this size. Their data indicated that natural mortality was a major limitation to the fishery. The abundance of rainbow trout and the quality of the fishery appear to rely heavily upon year-class strength. Greater recruitment is necessary to maintain abundance and allow enough fish to survive to trophy size. Successful spawning and emergence appears to be closely linked to flows. If minimum flows were maintained above 6,000 cfs (170 m³) April 1 to June 30, approximately 65% of available spawning habitat would be protected. We are currently exploring the feasibility of maintaining such a minimum flow with the Washington Water Power Company, owner and operator of Post Falls Dam. In addition, we also implemented a closure on fishing from March 1 to the general stream opener during 1988-1989 to protect vulnerable spawning adults.

Fishing mortality was estimated to make up less than 10% of total annual mortality. This appears to conflict with observations of local conservation officers and long-time (15-20 years) anglers who indicate fishing pressure has increased substantially in recent years. Large fish were apparently much more abundant in historic catch than they are now. Warm summer temperatures (24+°C), low flows, and fluctuating spring flows have been very similar for the past 80 years.

The estimate of fishing mortality was based on exploitation estimates from tag returns and is subject to bias by fishermen who fail to report tagged fish (Shetter 1968). Additional data are needed to better quantify fishing pressure and angler harvest. A tentative creel survey is planned for the 1988 field season to collect necessary data to determine if a regulation change is appropriate to maintain this unique urban trout fishery.

Stocking of brown trout in the lower Spokane River was curtailed in 1987 because research indicated the available habitat may be saturated (Dr. David H. Bennett, Professor of Fisheries Resources, University of Idaho, Moscow, personal communication). Brown trout were introduced to provide a trophy fishery with increasing fishing pressure and to take advantage of the abundant sucker and dace forage base. The percentage of brown trout in the electrofishing samples from 1985 and 1986 averaged about 6%; in the 1987 sampling effort, brown trout represented approximately 13% (18 of 142 fish). Additional information should be collected to determine growth and distribution of brown trout, whether natural reproduction is occurring, and relative contribution of brown trout to the fishery in the lower Spokane River.

Table 3. Back-calculated total length (mm) at annulus for rainbow trout captured in the Spokane River, Idaho, in September 1985 and October 1986.^a

	N	Age				
		1	2	3	4	5
1985	72	161				
	70	161	255			
	28	156	253	318		
	15	173	269	324	370	
	4	175	238	320	369	412
Average		162	256	320	369	412
1986	19	142				
	45	148	228			
	18	148	243	318		
	2	165	238	332	386	
Average		147	232	319	386	

^aAdapted from Bennett and Underwood, 1988.

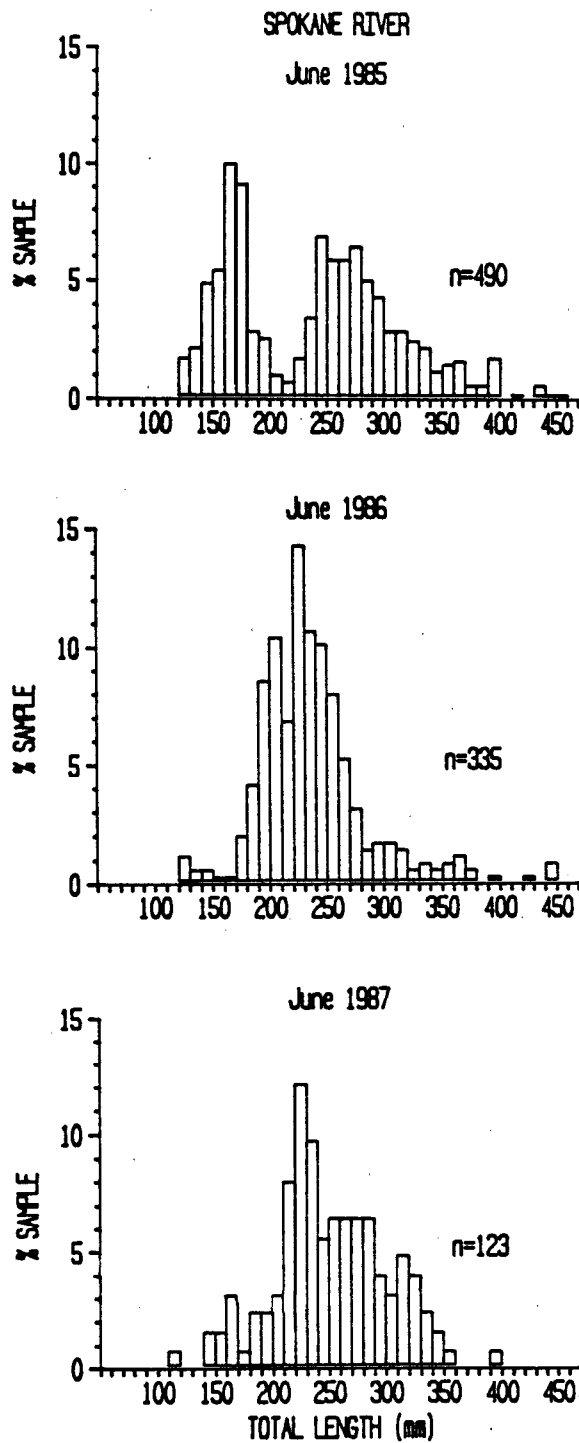


Figure 1. Length frequency distributions of rainbow trout collected from the Spokane River, Idaho, June 1985-1987.

Kootenai River

Counts of kokanee spawners in selected tributaries of the Kootenai River were comparable to 1986 estimates for Parker and Smith creeks, but no redds or spawning kokanee were observed in Boundary or Long Canyon creeks during 1987 (Table 4). Counts were made on September 4, corresponding to the 1986 counts. Boundary Creek appeared to be "fished out" during the redd surveys. Several groups of campers and trails were observed along the stream. Litter and snag hooks were lying about nearby. However, it is unknown whether the lack of spawning kokanee or redds in Boundary Creek in 1987 resulted from a weak year class moving through the fishery or overexploitation. Because of low flows during 1987, spawning kokanee may have been more susceptible to harvest. A further note of interest is that the largest estimate of spawning kokanee was made at the end of August 1985. Perhaps the spawning runs peaked earlier in August and were missed in the 1987 counts. The reason for the lack of spawning kokanee in Long Canyon Creek is not known.

Efforts to obtain kokanee eggs from Canada to initiate a small-scale enhancement program and maintain a local kokanee fishery were unsuccessful again in 1987. Surplus eggs are not available, as all hatchery production is needed to bolster declining numbers of kokanee salmon in Kootenay Lake, British Columbia.

Prespawning adult kokanee have been fairly abundant in the mainstem Kootenai River in recent years. It is speculated these fish are emigrants from Kootenay Lake, British Columbia, and apparently they provide a small seasonal fishery in the river (Greg Johnson, Senior Conservation Officer, Idaho Department of Fish and Game, Bonners Ferry, personal communication). With the advent of this mainstem fishery and the reopening of Boundary Creek in 1985 to kokanee harvest, public concern about the closure of Ball, Long Canyon, Mission, Myrtle, Park, Smith, and Trout creeks seems to have abated.

Instream Flows

The Department applied for instream maintenance flows on Grouse and Lightning creeks in 1981, and those applications were submitted for legislative review and approval during the 1988 legislative session.

Additional staff gauge and discharge measurements were collected on Grouse Creek in 1987 (Table 5) and will continue in 1988. It was not possible to establish a permanent staff gauge in Lightning Creek during 1987, but a bench mark was established, water surface elevations were determined, and discharge measurements made. Discharge measurements in Lightning Creek during August to October 1987 primarily reflected flows coming out of Spring Creek. Lightning Creek above the confluence with Spring Creek upstream to near the confluence with Cascade Creek (approximately 2 miles) flowed subsurface. Additional discharge measurements upstream of Cascade Creek should be collected in 1988 to better determine flows coming out of Lightning Creek.

Table 4. Estimates of spawning kokanee salmon in tributaries to the Kootenai River, Idaho, in August to September, 1983-1987.

Stream	Number observed					Comments
	1983 ^a	1984 ^a	1985 ^b	1986 ^c	1987 ^d	
Boundary	10	55	200	10	0	About 250 m around county road access
Long Canyon	300	17	650	400	0	From below East Side Road to flat gradient sections (about 500 m)
Parker	100	70	75	10	6	From Morter's gate downstream 650 m
Smith	150	130	1,500+	400	350	West Side Road Bridge upstream to falls

^aCounts made on August 15.

^bCounts made on August 31.

^cCounts made on September 6.

^dCounts made on September 4.

Table 5. Staff gauge readings and discharge estimates for Grouse Creek, Pack River drainage, Idaho, 1986-1987. Staff gauge is located on Southwest Bridge abutment located approximately 2.5 miles above the confluence with Pack River.

Date	Staff gauge readings	Discharge
07/10/86	0.67	--
07/17/86	0.72	--
07/21/86	0.55	--
07/24/86	0.54	19.06
08/02/86	0.44	--
08/06/86	0.40	--
08/11/86	0.38	--
08/15/86	0.38	5.69
08/22/86	0.33	--
09/06/86	0.35	--
09/19/86	0.49	17.20
10/05/86	0.84	--
10/15/86	0.66	29.97
06/12/87	0.98	68.63
06/26/87	0.81	44.68
07/13/87	0.62	19.01
07/23/87	0.67	23.49
08/07/87	0.50	--
08/21/87	0.48	9.47
09/11/87	0.38	5.76

Two additional streams were proposed for minimum instream flow requests in 1987, but data were not collected due to time constraints. We will use IFIM (Instream Flow Incremental Methodology) techniques in 1988 to determine instream flow needs in North Fork Grouse and Trestle creeks to protect critical spawning and rearing habitat for Gerrard rainbow and bull trout.

Lower Priest River Tributaries

During July 1986, we initiated a project to gather baseline information on habitat quantity and quality and fish population status in tributaries to the Priest River below Priest Lake. We continued collecting data in 1987 to determine appropriate management alternatives. The objectives of the projects were:

1. To determine the quality and quantity of spawning and rearing habitat in selected lower Priest River tributaries.
2. To determine species composition and relative abundance for fish in lower Priest River tributaries.
3. To assess age and growth characteristics of fish species in lower Priest River tributaries.
4. To propose management recommendations to improve the fisheries in the lower Priest River tributaries.

We collected baseline information on habitat quality and quantity from six tributaries (Figure 2) using the methodology developed by fishery biologists from the Idaho Panhandle National Forest (IPNF). This methodology subdivides a drainage into reaches on the basis of several morphological components (e.g., channel gradient, stream order, and valley bottom type). It provides information on quality and quantity of habitat type, cover, sediment, temperature, and spawning areas. Lengths and average width of eight habitat types were measured. Cover components (e.g., large woody debris, boulders, and undercut banks) were measured and percent total cover calculated. Habitat data were analyzed using a computer program also designed by biologists from the IPNF.

We collected fish in portions of the tributaries with a Coffelt BP-1C gas-powered backpack electroshocker or by angling (Figure 2). Fish were anesthetized in a weak solution of MS-222, identified to species, total length (mm) recorded, and scales samples of game fish collected for age and growth determination. Scale samples were collected from the caudal peduncle area, where they first form below the adipose fin, above the lateral line. Scales were impressed onto plastic laminate using approximately 20,000 pounds of pressure and read at 43X magnification on a Micro Design 920 microfiche reader. The distance from the focus to each annulus and the edge of the scale was measured at a 20° angle to the axis of the scale.

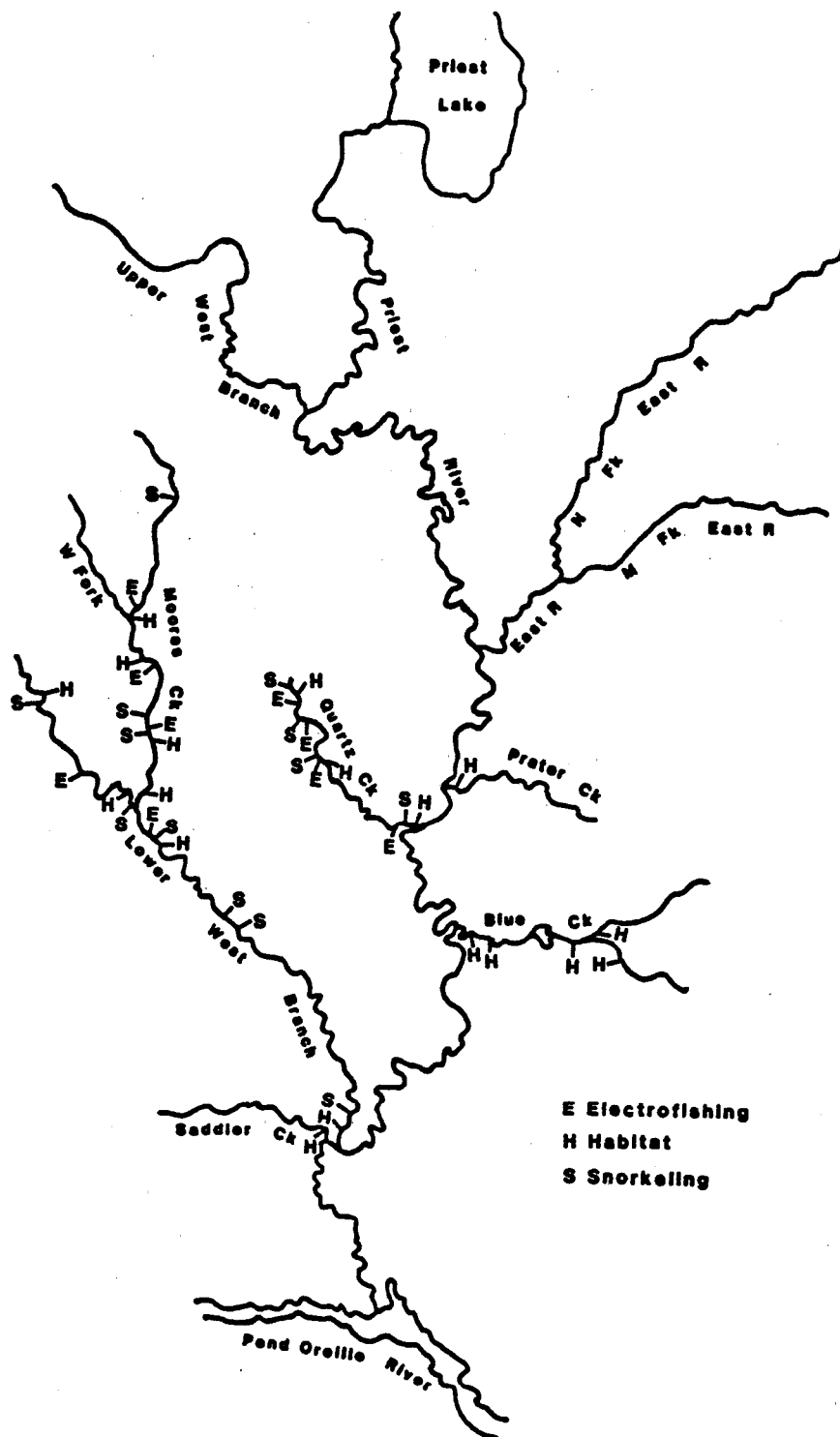


Figure 2. Locations of habitat, electrofishing, and snorkeling survey transects in tributaries of the lower Priest River, Idaho, June 1987.

We snorkeled selected tributaries to determine species composition, relative abundance and species distribution (Figure 2). Typically, a pool/riffle sequence was snorkeled, length and width were measured, and densities of fish per 100 m² calculated.

Habitat

We collected habitat information on six streams in 1987, bringing the total to 14 of 20 streams surveyed in the lower Priest River drainage. All six streams surveyed in 1987 were accessible to the river and thus are potentially useful to fluvial trout. Pool/riffle ratios were good in all streams, but the majority of the pools were either Class 3 or 4 (Table 6). Prater and Saddler creeks were nearly evenly divided between riffles and pools (Figure 3), while Moores and Blue creeks and the Lower West Branch were dominated by runs/glides (Figures 3-5). Quartz Creek had all habitat types represented, but was predominately pools (Figure 6).

Prater Creek was the least productive tributary surveyed, due primarily to the stream flowing subsurface approximately 600 feet above the mouth. The stream portion with flowing water lacked good streambank and instream cover, and spawning sites were limited.

Saddler Creek had excellent riparian and instream cover, but did not appear to have adequate spawning areas to produce a large fish population, although a few brook trout were observed in several small pools. The dense riparian vegetation, small stream size, and lack of good access to the stream likely prohibit much use of the stream by anglers.

The Lower West Branch was the largest tributary surveyed and appeared to be quite unproductive. Few spawning sites were identified (Table 6), and the stream bottom was primarily sand, silt or, clay. Instream and riparian cover was extremely limited, and few fish were observed either by snorkeling, electrofishing, or visual observation during habitat surveys. Little aquatic invertebrate production was observed. In addition, midday temperatures in June were 17°C (63°F) and probably exceed 21°C (70°F) during July and August.

Cattle grazed the upper end of Blue Creek above Blue Lake and caused considerable bank sloughing and bank instability. Riparian vegetation and instream cover were generally limited, but stream temperatures did not appear to be excessive (14°C; 57°F). Spawning sites appear to be limited in Blue Creek above and below Blue Lake.

In general, Quartz and Moores creeks had the best quality habitat of all surveyed tributaries. Instream and streambank cover were moderate to excellent and spawning sites were relatively numerous. Pools were more abundant and of better quality in Moores Creek than any other tributary.

Table 6. General habitat characteristics of six tributaries of the lower Priest River, Idaho, surveyed in June 1987
(LOM=large organic material, OV=overhanging vegetation, UB=undercut banks, and BK=brook trout).

Stream name	Reach length (mm)	Average width (ft)	Average gradient (%)	Pool/riffle ratio	Pool class (%)				Spawning sites surveyed	Comments
					1	2	3	4		
Prater Cr.	0.4	5	1	1:1	0	16	50	34	1	Bottom substrate is cobble covered with silt. Most of the flow is diverted into a small, manmade pond near the mouth. Streambed is dry above the pond (600 ft. above mouth).
Quartz Cr.	0.7	10	3	1.3:1	0	0	28	72	6	Excellent riparian and instream cover. Numerous boulder-created plunge pools. Several BK observed in pools. Several large banks are eroding and adding fines to stream near the mouth. Brown trout found here.
	2.0	5	1	3:1	0	0	40	60	5	Instream cover is excellent consisting primarily of LOM and OV. Substrate is mostly sand/silt and sand bars are prevalent. A few BK were observed.
	1.3	4	1	1.4:1	0	0	18	82	0	Instream cover is moderate consisting primarily of OV and aquatic vegetation. Substrate is sand. The stream is blocked by beaver dams above the Road 416 crossing.

Table 6. Continued.

Stream name	Reach length (mm)	Average width (ft)	Average gradient (%)	Pool/riffle ratio	Pool class				Spawning sites surveyed	Comments
					1	2	3	4		
Blue Cr.	1.5	10	1	1.8:1	0	21	50	29	3	Twenty feet tall waterfall below the Eastside Road crossing. Stream below falls and upstream to Blue Lake is silt/sand bottom. OV is predominate instream cover type.
	1.4	9	1	1.7:1	8	24	24	44	3	Little riparian vegetation and instream cover consists of few UB and little OV. Cattle were present and grazing impacts were prevalent (e.g., bank sloughing, bank instability). A few BK juveniles were observed.
Blue Cr. Trib.	1.6	6	1	2.1:1	0	0	66	34	5	Stream meanders through large clearcut and open meadow. Impacts of cattle grazing evident. Riparian vegetation limited. Instream cover is moderate, consisting largely of LOM and UB. Brook trout were numerous. Above this reach is a series of large bogs/beaver ponds, and several brook trout were observed (5-7").
Lower West Branch	0.9	25	2	1.2:1	0	14	57	29	8	The lower portion of the reach is largely composed of runs (63% of all habitat). The stream bottom is sand/silt or heavily embedded cobble. Instream cover was virtually nonexistent (<1%). A few cyprinid fry were observed.

Table 6. Continued.

Stream name	Reach length (mm)	Average width (ft)	Average gradient (%)	Pool/riffle ratio	Pool class				Spawning sites surveyed	Comments
					1	2	3	4		
Lower West Branch (Cont)	2.7	22	1	10:1	0	20	65	15	5	Substrate is primarily coarse sand and sand bars are numerous. Instream cover is slightly better than in previous reach (8%) with OV and LOM predominate. Few fish were observed.
	3.3	16	1	12.2:1	27	57	16	0	0	Substrate is clay/sand with several large clay cut banks throughout the reach. Instream cover is largely LOM, but it is sparse (13%). No fish were observed in this reach.
Moores Cr.	3.1	11	11	2.4:1	0	54	39	7	31	Reach dominated by pools (41%) and runs (39%). The stream bottom was orange colored, possibly due to an iron precipitate. OV provided the bulk of instream cover along with large mats of fontinalis. A few salmonid fry were observed.
	2.7	9	1	3.3:1	70	30	0	0	0	Stream meanders through large open meadow adjacent to State Highway 57. Instream aquatic vegetation and OV provide most of the cover. Stream supports excellent BK population.

Table 6. Continued.

Stream name	Reach length (mm)	Average width (ft)	Average gradient (%)	Pool/riffle ratio	Pool class				Spawning sites surveyed	Comments
					1	2	3	4		
Saddler Cr.	1.1	6	2	1.2:1	0	0	29	71	0	Riparian cover is excellent; instream cover is adequate and created primarily by LOM and OV. substrate is mostly sand or cobbles covered with sand. Several large slumps appear to be sources of fine sediment in stream. Small BK were observed in several pools.

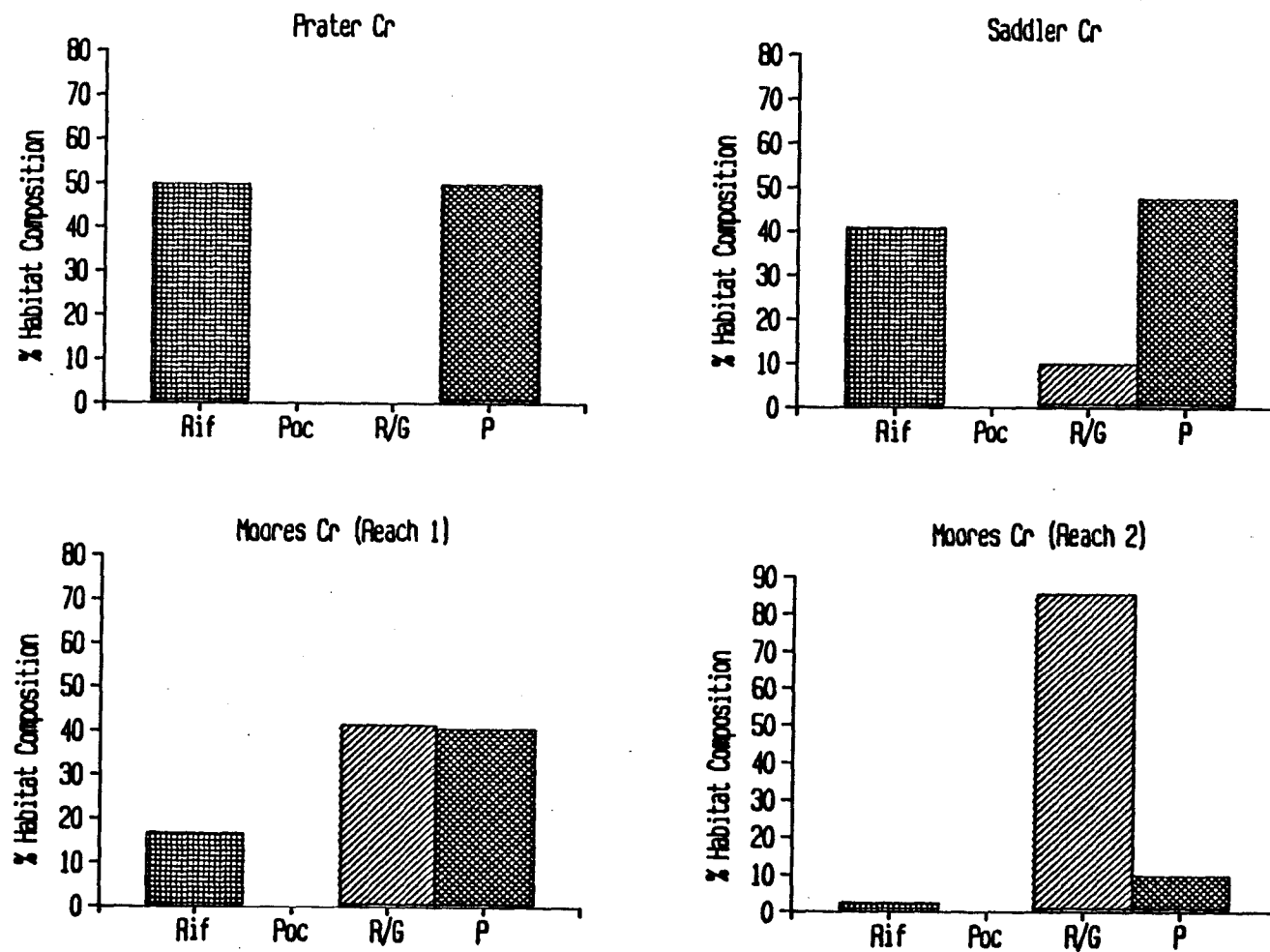


Figure 3. Percent habitat composition for Prater, Saddler, and Moores creeks, lower Priest River drainage, Idaho, June 1987. (Rif=riffle, Poc=pocketwater, R/G=run/glide, and P=pond).

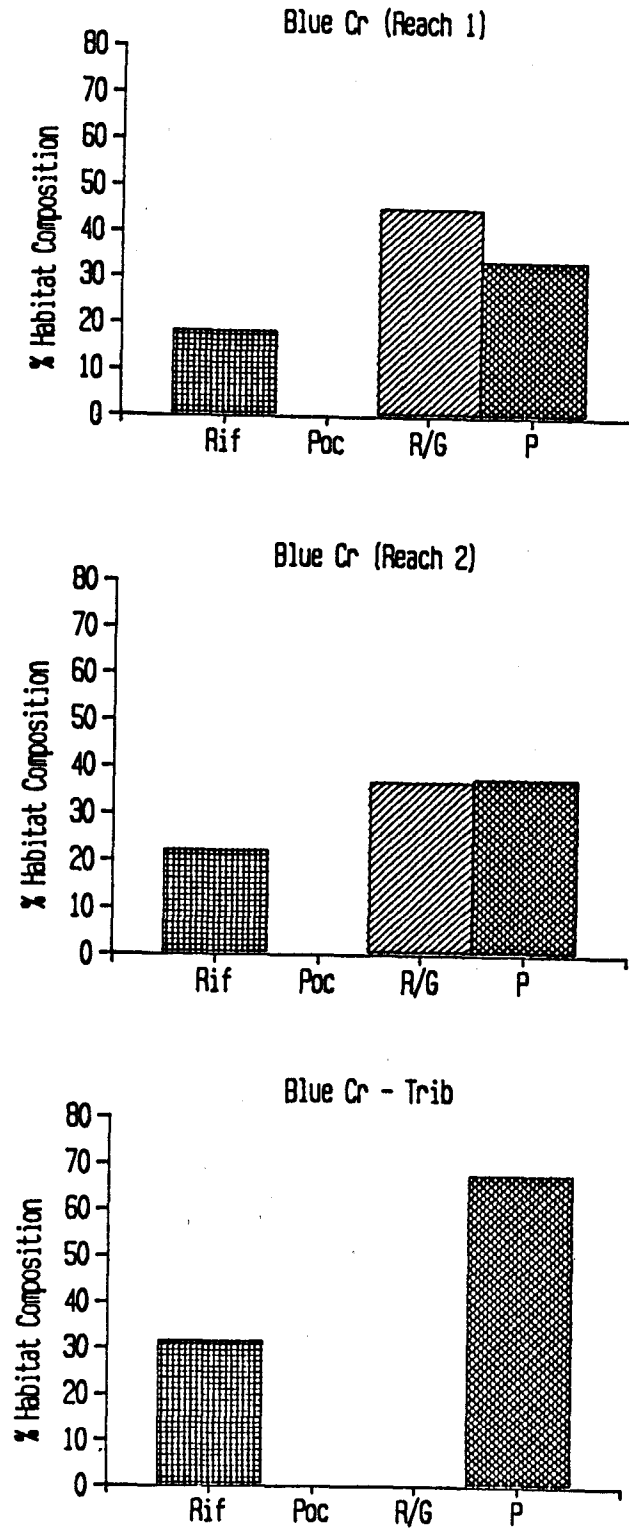


Figure 4. Percent habitat composition for Blue Creek, lower Priest River drainage, Idaho, June 1987 (Rif=riffle, Poc=pocketwater, R/G=run/glide, and P=pond).

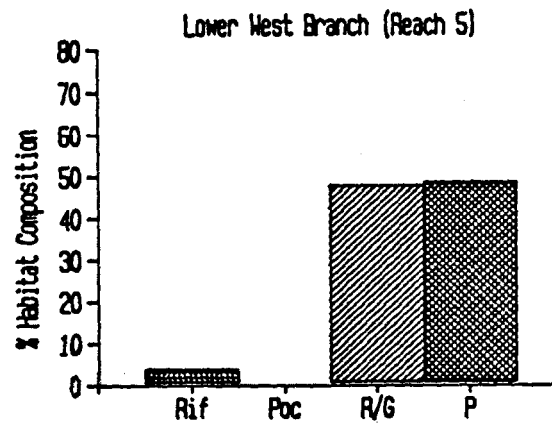
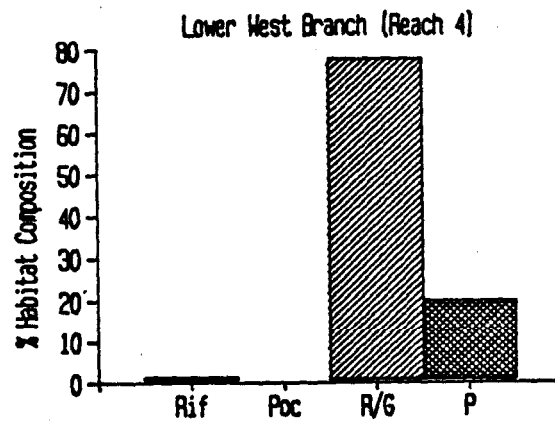
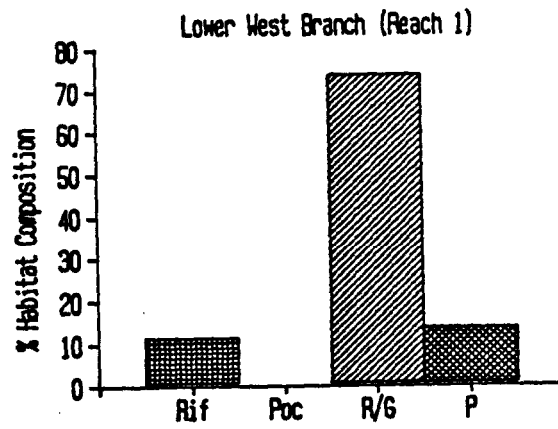


Figure 5. Percent habitat composition for Lower West Branch, lower Priest River drainage, Idaho, June 1987 (Rif=riffle, Poc=pocketwater, R/G=run/glide, and P=pond).

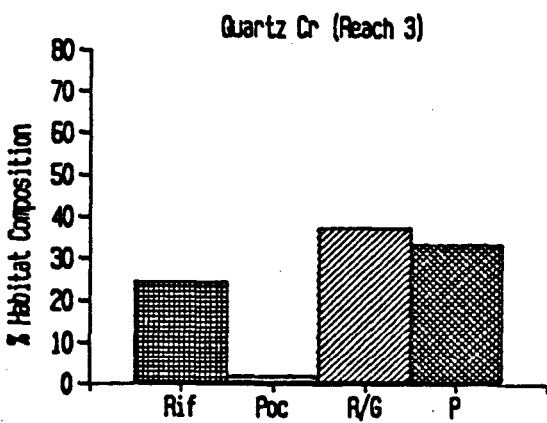
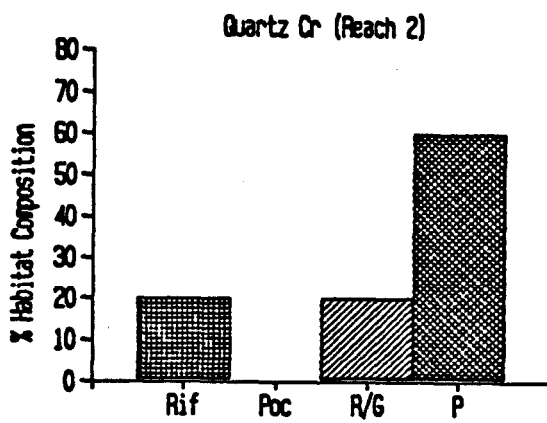
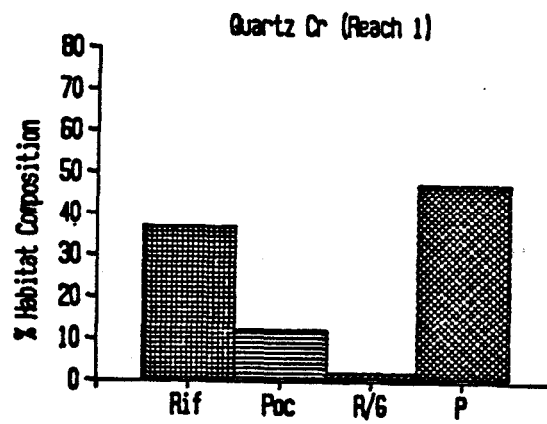


Figure 6. Percent habitat composition for Quartz Creek, lower Priest River drainage, Idaho, June 1987 (Rif=riffle, Poc=pocketwater, R/G=run/glide, and P=pond).

Fish Populations

Species composition, relative abundance, and distribution. Species observed in lower Priest River tributaries in 1987 included brook trout Salvelinus fontinalis, westslope cutthroat trout Salmo clarki lewisi, brown trout Salmo trutta, largescale suckers Catostomus macrocheilus, redbase shiners Richardsonius balteatus, longnose dace Rhinichthys cataractae, pumpkinseeds Lepomis gibbosus, brown, bullhead Ictalurus nebulosus, and channel catfish Ictalurus punctatus.

Redside shiners, longnose dace, pumpkinseeds, brown bullhead, and channel catfish were observed only in the lowest reach of the Lower West Branch. The sighting of channel catfish was highly unexpected and were probably fish stocked in Blue Lake. These fish would had to have migrated out of the lake and down the main river, then back up the Lower West Branch, a distance of approximately 5.6 km. Such long migrations are not atypical of channel catfish in search of suitable spawning areas (Scott and Crossman 1973; Simpson and Wallace 1982). Specimens were not collected so we were not able to determine stage of maturity. Largescale suckers were observed in both the Lower West Branch and Moores Creek.

Brook trout were the most abundant and most widely distributed species of game fish (Figure 7). They were observed in every drainage surveyed, with the exception of Prater Creek. Their densities were highest in Quartz Creek (Table 7). Cutthroat and brown trout were collected only from the lowest reach of Quartz Creek and found in nearly equally abundance. Density estimates were not made in either Blue or Saddler creeks. No bull trout were found in any tributaries in 1987 and are apparently restricted to the East River drainage (Horner et al. 1987).

Age and Growth

Brook trout. A total of 57 brook trout were collected from Moores Creek. Scales from 38 fish were examined for age determination. Fish ranged in age from 0 to 3 and were 38 to 254 mm in total length (Figure 8). The larger fish may well have been older than 2 years old, but we were unable to age scales for fish >220 mm long. Back-calculated length at annulus formation was 94 mm at age 1 and 143 mm at age 2 (Table 8).

Brook trout collected from Quartz Creek (N = 19) ranged in age from 0-2 and from 41 to 182 mm in total length (Figure 9). Of the 16 fish aged, back-calculated length at annulus formation was 96 mm at age 1 and 143 mm at age 2 (Table 9).

In general, growth of brook trout in Moores and Quartz creeks was comparable to that reported by Carlander (1969) for other western waters. Growth appears to be slightly better than for brook trout collected from other lower Priest River tributaries in 1986 (Horner et al. 1987). This may be due to smaller sample sizes examined in 1987, or it could indicate Moores and Quartz creeks are more productive systems.

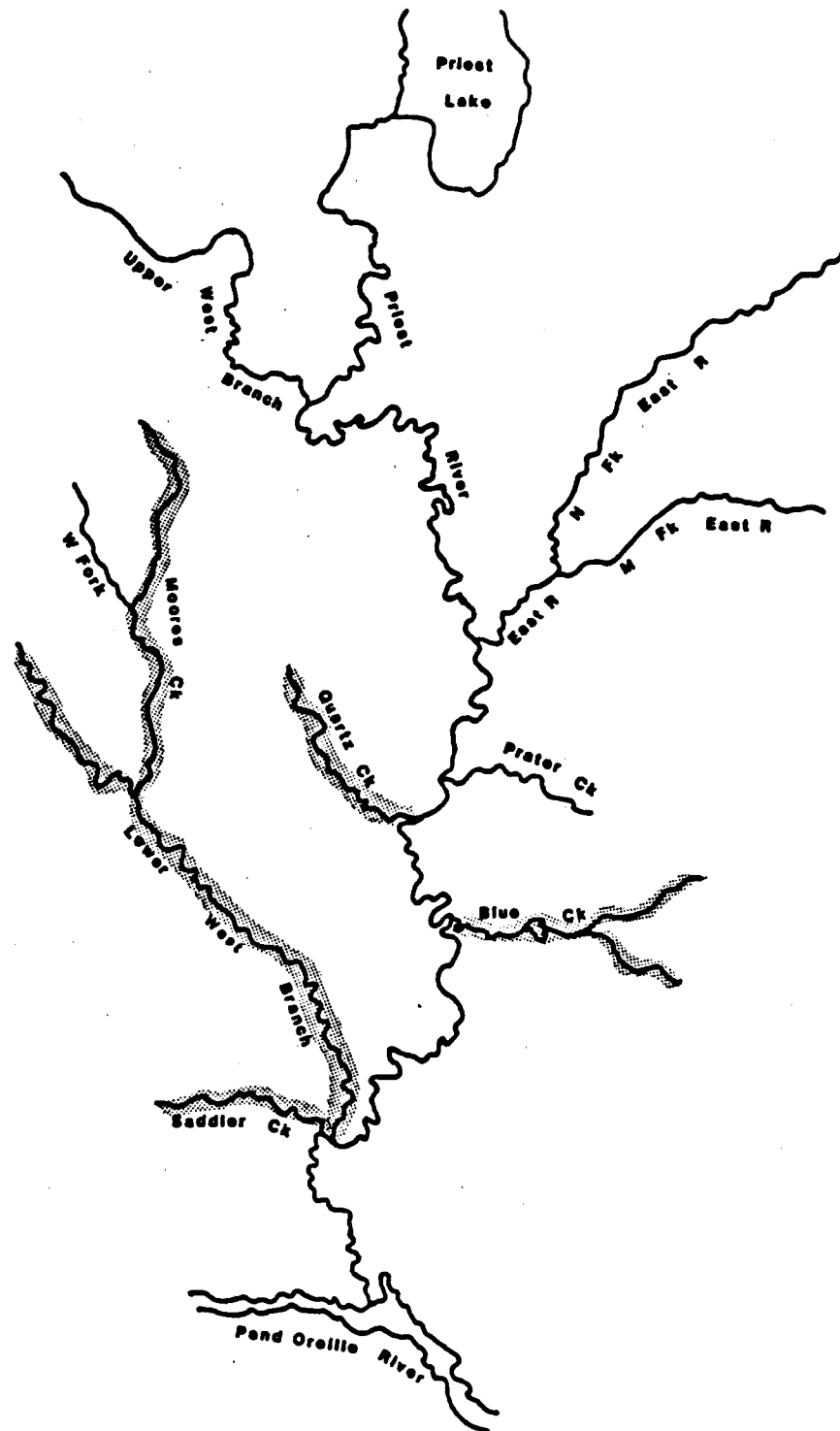


Figure 7. Distribution of brook trout in tributaries of the lower Priest River, Idaho, June 1987.

Table 7. Densities of (fish/100 m²) of fish collected by snorkeling tributaries of the lower Priest River, Idaho, June 1987.

Stream	Section	Species ^a	Density (fish/100 m ²)
Moore's Creek	1	BK	29.9
	2	BK	25.8
	3	BK	2.1
Quartz Creek	1	BK	56.8
		CT	1.5
		BN	2.2
	2	BK	23.0
	3	BK	4.3
Lower West Branch	1	BK	4.1
	2	BK	0.3
	3		
	4	BK	5.4
	5	BK	0.4
	6	--	--
	7	BK	2.4

^aBK=brook trout, CT=cutthroat trout, and BN=brown trout.

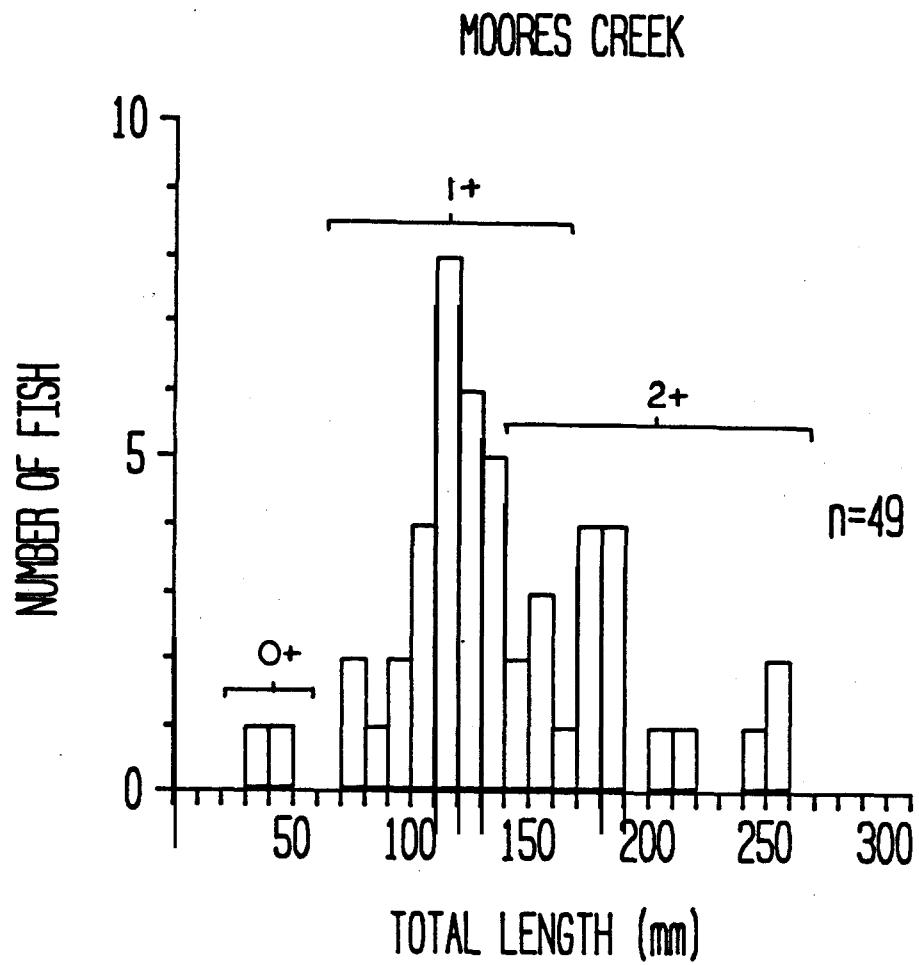


Figure 8. Length frequency and age distribution of brook trout collected from Moores Creek, lower Priest River drainage, Idaho, June 1987.

Table 8. Back-calculated lengths (mm) at annulus formation and increment of growth for brook trout in the Moores Creek, lower Priest River drainage, Idaho, July 1987.

Age class.	N	1	2
I	25	92	--
II	13	97	143
Average length		94	143
N		38	13
Increment of growth		94	49

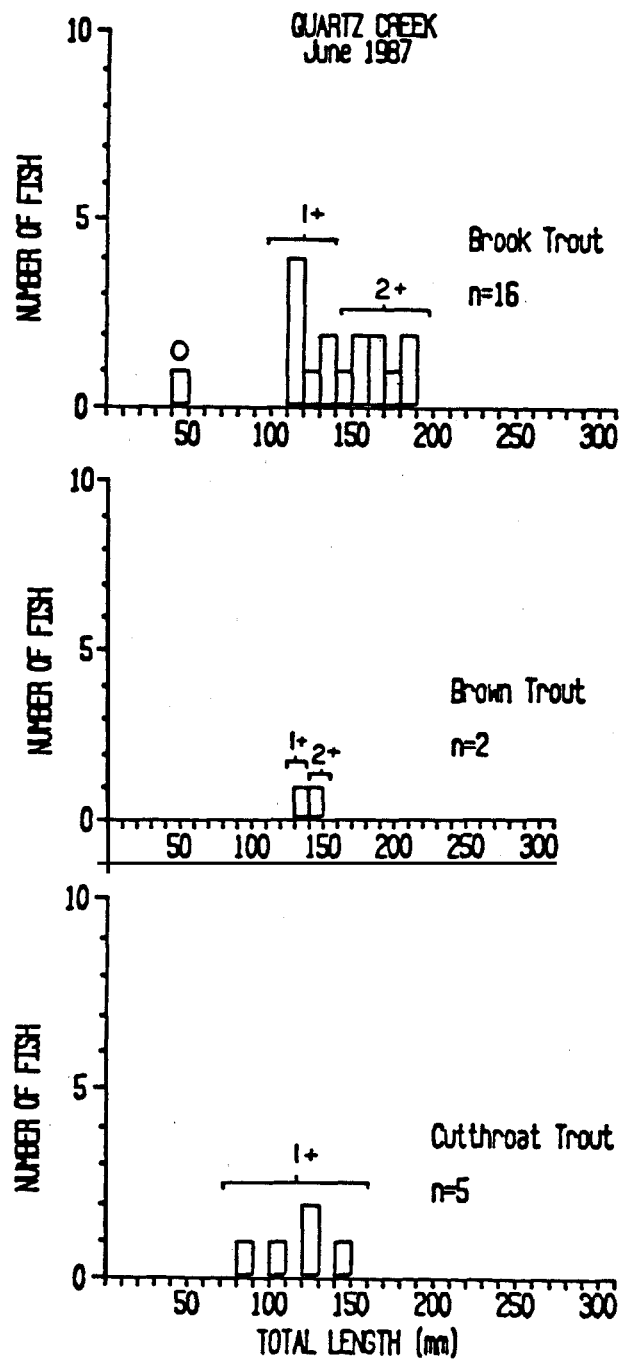


Figure 9. Length frequency and age distribution of brook, brown, and cutthroat trout collected from Quartz Creek, lower Priest River drainage, Idaho, June 1987.

Table 9. Back-calculated lengths (mm) at annulus formation and increment of growth for brook trout in Quartz Creek, lower Priest River drainage, Idaho, June 1987.

Age class	N	1	2
I	6	95	--
II	8	97	134
Average length		96	134
N		14	8
Increment of growth		96	38

Brook trout collected from Lower West Branch (N 5) ranged in length from 46 mm to 166 mm and in age from 0 to 2 years. Back-calculated length at annulus formation was not determined due to limited sample size.

Brook trout observed in Blue and Saddler creeks were not sampled for age and growth determination.

Cutthroat trout and brown trout. Cutthroat and brown trout were collected only from Quartz Creek and in limited numbers (5 and 2 fish, respectively). Cutthroat collected were age 1 and ranged in length from 87 mm to 146 mm. Brown trout were age 1 and age 2 and were 135 mm and 146 mm in length, respectively. No age 0 brown trout were collected by electrofishing, although they were observed during snorkeling.

Discussion

Moore's and Quartz creeks support good populations of resident brook trout. Densities of brook trout are much greater than reported for other lower Priest River tributaries (Horner et al. 1987). Densities of brook trout in the Lower West Branch are comparable to other northern Idaho streams.

Westslope cutthroat trout were limited in distribution to the Binarch Creek, East River, Big Creek, and Quartz Creek drainages. Densities of fish in Quartz Creek were less than reported for tributaries surveyed in 1986 (Horner et al. 1987). Brown trout were found only in Quartz Creek in 1987 and in the East River and Big Creek drainages in 1986.

Densities of brown trout are relatively low, 0.8 to 3.9 fish/100 m² (Table 10), indicating the introduction of brown trout into the lower Priest River drainage has had limited success to date. This limited success may be the result of poor survival of stocked fish. The trout stocked are from a domesticated Massachusetts strain that has been hatchery bred for many years. These fish may be so highly domesticated they do not survive well when released in the wild (Mike Larkin, Resident Fish Hatcheries Supervisor, Boise, Idaho, personal communication). Fish hatchery personnel (Gene McPherson, Hatchery Superintendent 2, Clark Fork Hatchery, Clark Fork, Idaho, personal communication) also indicate in general that brown trout tend to crowd up at the bottom of transport tanks where they may become stressed and hence may not survive well following release.

The Department is currently attempting to develop its own brown trout broodstock from selected wild populations in the state. If the effort proves successful, progeny should be stocked and their contribution to the fishery evaluated. A more complete evaluation of the success of the brown trout stocking program should be done.

Table 10. Average number of cutthroat trout (<300 mm and >300 mm) per transect in 1980-1981 and 1987 from three locations in the upper Coeur d'Alene River drainage, Idaho.

Site	Month/year	<300 mm	>300 mm	Total
Coeur d'Alene River between Yellowdog and Teepee creeks	Aug/80-81	4.5	1.8	6.3
	Aug/87	22.6	2.8	25.4
	Sept/80-81	3.9	1.5	5.4
	Sept/87	17.4	2.8	20.2
Coeur d'Alene River between Teepee and Jordan creeks	Aug/80-81	3.8	2.4	6.2
	Aug/87	7.6	8.8	16.4
	Sept/80-81	1.9	1.5	3.4
	Sept/87	5.6	7.8	13.4
Teepee Creek between Independence Creek and the mouth	Aug/80-81	0.5	2.0	2.5
	Aug/87	0.4	1.8	2.2
	Sept/80-81	1.1	0.9	2.0
	Sept/87	0	1.4	1.4

From limited creel census data collected by the local conservation officer in 1986, it appears that Moores Creek supports a popular fishery during the early portion of the fishing season (opener to late June). Catch rates were 2.5 fish/hour for 7- to 10-inch brook trout. The scarcity of older (3+) aged fish in the electrofishing sample and high catch rates seem to indicate high exploitation of the brook trout population in Moores Creek. Absence of age 3 and older fish is not typical of lightly to moderately exploited brook trout populations (MacCrimmon and Berst 1961; Hunt 1966). Marshall and MacCrimmon (1970) also reported an absence of brook trout older than age 2 from a heavily exploited population in the Sydenham River, Ontario. However, the apparent high exploitation of older fish may have resulted in a compensatory growth response. From the length and age distribution (Figure 10), it appears brook trout are growing vigorously in Moores Creek. High exploitation may have reduced fish densities sufficiently to result in increased growth rates of age 1 and age 2 fish. Length at annulus formation and increment of growth are greater for brook trout in Moores Creek than other lower Priest River tributaries (Horner et al. 1987).

Habitat in the **six** tributaries evaluated in 1987 generally was in better condition compared to tributaries evaluated in 1986. Pool/riffle ratios were 1.1 or greater, and instream and riparian cover were generally good. Most areas of poorer habitat were in drainages held largely in private ownership (e.g., Blue Creek). Opportunities for habitat improvement in Blue Creek should focus on the restriction of cattle from the riparian zone. Re-establishment of riparian vegetation would greatly enhance bank stability and reduce sediment input to the stream.

The ditch diverting water from Prater Creek into a manmade pond should be screened to prevent entrapment of fish. The reason for the stream flowing subsurface above the pond should be further investigated and measures taken to solve the problem if feasible.

The predominate substrate of sand and clay and the lack of instream cover restrict the productive potential of the Lower West Branch. Sand and clay appear to be natural stream sediments. The Lower West Branch, like the Upper West Branch, flows through a highly erosive, granitic land type. Few aquatic insects were observed during our habitat surveys, and fish likely depend on terrestrial insects for food. Increasing instream cover would provide additional holding space for fish, but would not likely increase aquatic insect production.

Coeur d'Alene River

Evaluation of Catch-and-Release Regulations

Special regulations (3 fish, none under 13 inches) implemented on the upper Coeur d'Alene River (above and including Yellowdog Creek) in 1975 stopped the decline of the westslope cutthroat population, but did not result in a significant increase in the population or fishery.

Noncompliance with regulations was an important factor limiting population expansion (Lewynsky 1986). In addition, habitat degradation as a result of logging, road building and channelization has significantly reduced the productive potential of spawning and rearing areas. Recognizing the Coeur d'Alene system had not responded to its potential, catch-and-release regulations were implemented in 1985 in an effort to increase spawning escapement and recruitment and improve the fishery.

Response of cutthroat population dynamics to regulation changes was evaluated in 1987. Permanent transects were sampled using a mask, snorkel, and wet suit. Transects, averaging 100 m in length, had been established in 1973 and sampled again in 1980 and 1981, prior to implementation of catch-and-release regulations.

Transects consisted of pools and runs (delimited by shallow riffles) which appeared to provide good trout habitat. Fifteen transects (5 in the Coeur d'Alene River between Teepee and Jordan creeks, 5 between Yellowdog and Teepee creeks, and 5 in Teepee creek between Independence Creek and the mouth) were snorkeled in early August and September, when visibility was about 5 m. Cutthroat trout were enumerated by two size classes: shorter than 300 mm and longer than 300 mm. The 300-mm class limit was chosen to be consistent with data collected in 1980 and 1981.

Overall cutthroat abundance appears to have increased (2-5X) in the Coeur d'Alene River from 1980-1981 to 1987 (Table 10). Catch-and-release regulations apparently had the desired effect of increasing recruitment. However, the percentage of large cutthroat (>300 mm) in the sample did not change significantly from 1980-1981 to 1987 and actually declined in the stream from Yellowdog Creek to Teepee Creek (Figure 10). The scarcity of larger (>300 mm) fish may indicate that noncompliance with regulations (anglers illegally harvesting larger fish) is still a significant problem. Many anglers have reported witnessing illegal harvest of cutthroat from the upper river. The harvest of large fish in the lower river also likely contributed to the slow recovery of the fishery. A creel survey conducted on the lower Coeur d'Alene River (Enaville to Dudley) in 1986 estimated over 1,700 cutthroat trout were harvested during a six-week period (May 24-June 28) with a mean size of 317 mm and 22% of the harvested fish exceeding 350 mm (Horton et al., in preparation). The mean size of spawning adults trapped in lower Coeur d'Alene River tributaries was 353 mm. The opportunity exists to harvest many fish before they have the chance to spawn for the first time.

The goal of the current Five Year Management Plan is to provide catch rates of 2.0 fish/hour or greater, with 10% of the catch exceeding 330 mm in the main river above Yellowdog Creek. We are currently well below the proposed catch rates (Horner et al. 1986, 1987). Additional creel and trout abundance data will be collected in 1988 to further assess the response of the fishery to catch-and-release regulations.

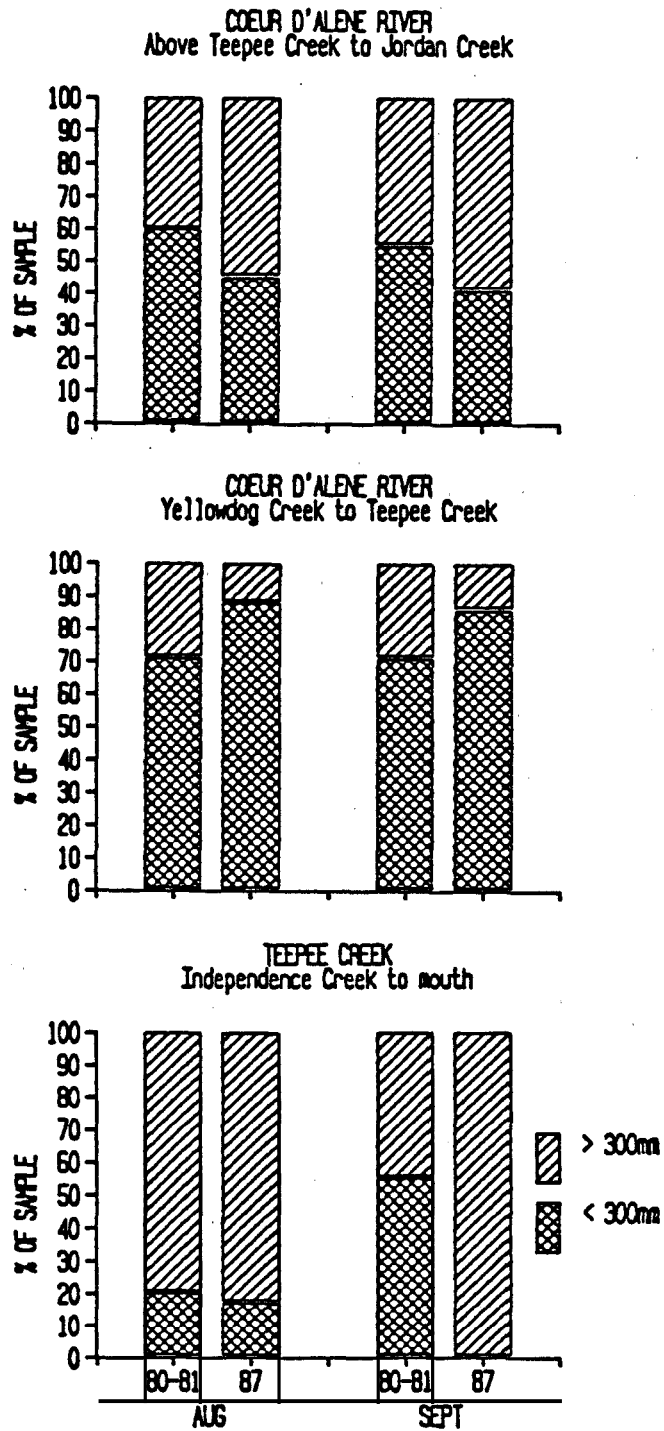


Figure 10. Percent composition of cutthroat trout <300 mm and >300 mm in length observed by snorkeling transects in three locations in the upper Coeur d'Alene River drainage, Idaho, August and September, 1980-1981 and 1987.

Cutthroat Trout Regulation Development

Past and present research data indicate that overharvest of fish is a major factor limiting northern Idaho cutthroat populations (Thurrow and Bjornn 1978; Johnson and Bjornn 1978; Lewynsky 1986). As described above, habitat has been limited by various land use activities, but there is currently underseeded habitat in many areas (William Horton, Fishery Staff Biologist, Boise, Idaho, personal communication). Our goal is to increase spawner escapement and to fully seed available habitat. High quality stream fishing opportunities for native cutthroat will be enhanced through increased population levels.

We modeled seven different regulation scenarios using Ricker's method to estimate equilibrium yield (Ricker 1975):

- a. 6 fish only $\geq 16"$, no gear restrictions (1986-1987 regulations);
- b. 1 fish any size, no gear restrictions;
- c. 2 fish any size, no gear restrictions;
- d. 3 fish any size, no gear restrictions;
- e. 1 fish $\geq 14"$, no gear restrictions;
- f. 1 fish $\geq 14"$, no bait allowed, single barbless hook required; and
- g. 2 fish $\geq 14"$, no gear restrictions.

Age specific instantaneous rates of fishing mortality (F) were estimated based on an exploitation rate of 0.32 (William Horton, personal communication) and total annual mortality rates (A) of 0.50 for ages 1-2 and 2-3 (Bjornn et al. 1977); and 0.67 for ages 3-4, 0.70 for ages 4-5, and 0.95 for age 5 and older (Lewynsky 1986). The model assumes no immediate compensatory change in natural mortality rates with changes in F. Rankel (1971) and Lewynsky (1986) both believe cutthroat trout populations in the relatively infertile waters of northern Idaho exhibit low reproductive potential and nonresilient stock-recruitment relationships. Hence, they are not capable of a compensatory response in a short period of time.

Of the seven regulation scenarios modeled, the one fish per day, 14-inch minimum, no gear restrictions appeared to be the best biological and social option. It increased the average size of fish in the catch from 269 mm to 294 mm and achieved our goal of increasing spawner escapement from 29 spawners/1,000 recruits to 45 spawners/1,000 recruits (Table 11). It also allowed fishing with bait, which 462 of anglers in the Coeur d'Alene River use (Lewynsky 1986).

A one-fish daily bag was recommended because of our unproductive waters, extensive road and trail access, and heavy fishing pressure (30,000-40,000 hours of effort per year in the general regulation area of the Coeur d'Alene River). A one-fish limit will help distribute the harvest to more people over a longer period of time. The 14-inch minimum size limit should protect adult cutthroat until they spawn at least once. Horton et al. (in preparation) report the mean size of spawning adult cutthroat trapped in tributaries to the Coeur d'Alene River was 353 mm (13.9 inches). The one cutthroat will be included in the daily six trout bag limit.

Table 11. Change in spawner escapement and average length of cutthroat in the catch from the Coeur d'Alene River, Idaho.

Regulation	\bar{x} TL in Catch (mm)	Unit escapement (# spawners/1,000 recruits)
6 fish/day - only 2 $\geq 16"$ ^a	269 mm (10.6")	29
1 fish/day - any size ^b	276 mm (10.9")	40
2 fish/day - any size ^b	272 mm (10.7")	33
3 fish/day - any size ^b	272 mm (10.7")	29
1 fish/day - 14" minimum ^c (no gear restrictions)	294 mm (11.6")	45
1 fish/day - 14" minimum ^d (no bait, single barbless hook)	336 mm (13.2")	64
2 fish/day - 14" mm ³ (no gear restrictions)	288 mm (11.3")	38

^a1986-1987 regulations.

^bAssumes anglers do not sort fish, so hooking mortality is 0%; no gear restrictions.

^cAssumes 50% hooking mortality with bait (Shetter and Allison 1955; Mason and Hunt 1967) and 100% compliance with regulation. ^dAssumes 10% hooking mortality (Lewynsky 1986) and 100% compliance with regulations.

^eAssumes 75% hooking mortality and 100% compliance with regulation.

We believed the most logical way to manage westslope cutthroat trout was on a drainagewide basis. Hence, the one cutthroat, 14-inch minimum has been implemented on the following waters: the lower Coeur d'Alene River, lower North Fork Coeur d'Alene River, South Fork Coeur D'Alene River, lower St. Joe River, St. Maries River, upper Spokane River, and Lake Coeur d'Alene. The upper sections of the Coeur d'Alene, North Fork Coeur d'Alene, and the St. Joe rivers will be managed as catch-and release fisheries.

We recommended a late season opening on the lower Coeur d'Alene River (below the South Fork Coeur d'Alene River) and the Spokane River from Coeur D'Alene Lake downstream to Green Ferry Road to eliminate a "hot spot" fisheries. As previously reported, large numbers of adult cutthroat are harvested by a relatively few anglers in a short time period every spring. By opening these areas on July 1, we give those fish a chance to disperse and become available during an extended period.

We recommended a September 10 closure on the harvest of cutthroat in the Coeur d'Alene River below Yellowdog Creek. We believe an early closure is biologically necessary to protect overwintering cutthroat in the river. Thurow and Bjornn (1978) and Lewynsky (1986) observed downstream movement in the fall as water temperatures dropped. Cutthroat concentrate in relatively few deep holes in the river to overwinter. Conservation officers have reported high catch rates and harvest of prespawning cutthroat in October as water temperatures drop. Evaluation of the impacts of the new cutthroat regulations will be undertaken in 1988.

We recommended a three-cutthroat limit, 8-inch minimum size in the general six trout daily bag for tributaries to the stream sections under the one cutthroat, 14-inch minimum size regulation, in addition to selected tributaries to Lake Coeur d'Alene. This will allow harvest of resident cutthroat in the tributaries and still protect the majority of the juvenile migratory cutthroat rearing in the streams. Anglers will be allowed to keep 10 brook trout in addition to the 6 trout daily bag.

Compliance with regulations is a critical factor influencing success of our management program. To maximize compliance, we will increase our signing and informational program to ensure that most anglers are informed of the reasons for the new regulations and of the alternatives for other angling opportunities in the same area. News releases, large and small, interpretive signs, and brochures will be placed or made available throughout the area. The Region 1 planning process also identified the Coeur d'Alene system as an enforcement priority.

Brown Trout Evaluation

Experimental releases of brown trout have been made in a number of Region 1 streams since the mid-1970s, but more recently in Hoodoo and Cocolalla creeks (Table 12). Brown trout have been introduced to enhance and diversify existing fisheries and to take advantage of abundant forage, such as brook trout, dace, and suckers. Evaluations of the success of such introductions have been made only for Hoodoo and Cocolalla creeks. Surveys of other waters are not planned for 1988.

Table 12. Releases of brown trout into Hoodoo and Cocolalla creeks, Pend Oreille drainage, Idaho, 1981-1987.

Location	Year	Number of fish		
		Fry (0-3")	Fingerling (3-6")	Catchable (6+")
Hoodoo Creek	1981	0	0	2,821
	1982	50,375	0	0
	1983	51,750	0	0
	1985	0	51,460	0
	1986	49,973	0	0
	1987	<u>50,552</u>	<u>0</u>	<u>0</u>
	Total	202,650	51,460	2,821
Cocolalla Creek	1983	51,750	0	0
	1985	0	10,000	0
	1986	10,043	0	0
	1987	<u>10,080</u>	<u>0</u>	<u>0</u>
	Total	71,873	10,000	0

In July 1987, we evaluated habitat quality and quantity and status of brown trout and other salmonid populations in Hoodoo and Cocolalla creeks. Habitat data were collected using the IPNF stream habitat survey previously described.

Species composition, relative abundance, and species distribution was determined by electrofishing, snorkeling, or observation during habitat surveys. Fish sampled for age and growth determinations were collected by electrofishing short sections of stream with a Coffelt BP-1C gas-powered backpack electroshocker or by angling. Age and growth determinations were made as previously described.

We collected habitat data throughout most of the Hoodoo (Figure 11) and Cocolalla Creek drainages (Figure 12). In general, the predominate habitat types in Hoodoo and Cocolalla creeks are riffles and runs (Table 13). The two streams lack pools poor (<20% of the total habitat) and most pools are poor quality (Class 3 or 4). In Cocolalla Creek, the better spawning habitat was found in the upper reach, whereas the opposite was found in Hoodoo Creek. Often, the best spawning sites were associated with areas of abundant instream and riparian cover. Instream cover was usually less than 10X. Water temperatures ranged from 14-25°C during habitat and snorkeling surveys.

Substrate in Cocolalla Creek was mostly cobble, whereas sand and silt comprised most of the substrate in Hoodoo Creek. Overall, it appeared that habitat was better in Cocolalla than Hoodoo Creek.

Fish Populations

Species Composition, Relative Abundance, and Distribution

Species of game fish found in Cocolalla and Hoodoo creeks were brown trout, rainbow trout, brook trout, largemouth bass, yellow perch, pumpkinseeds, redbreast shiners, dace, and suckers.

Of the three salmonid species observed, brook trout were most numerous, particularly in Cocolalla Creek (Table 14). Brown trout were observed infrequently in Hoodoo Creek during snorkeling surveys and not at all in Cocolalla Creek. Overall, trout densities were much greater in Cocolalla than Hoodoo Creek.

Largemouth bass were observed in Cocolalla Creek and pumpkinseeds in Hoodoo Creek. These species were sighted only in the lower most transects of both streams, near their confluence with the Pend Oreille River.

Brook trout were distributed throughout both Hoodoo and Cocolalla creeks. Rainbow trout were more restricted in their distribution (Figures 13 and 14), as were brown trout (Figures 15 and 16).

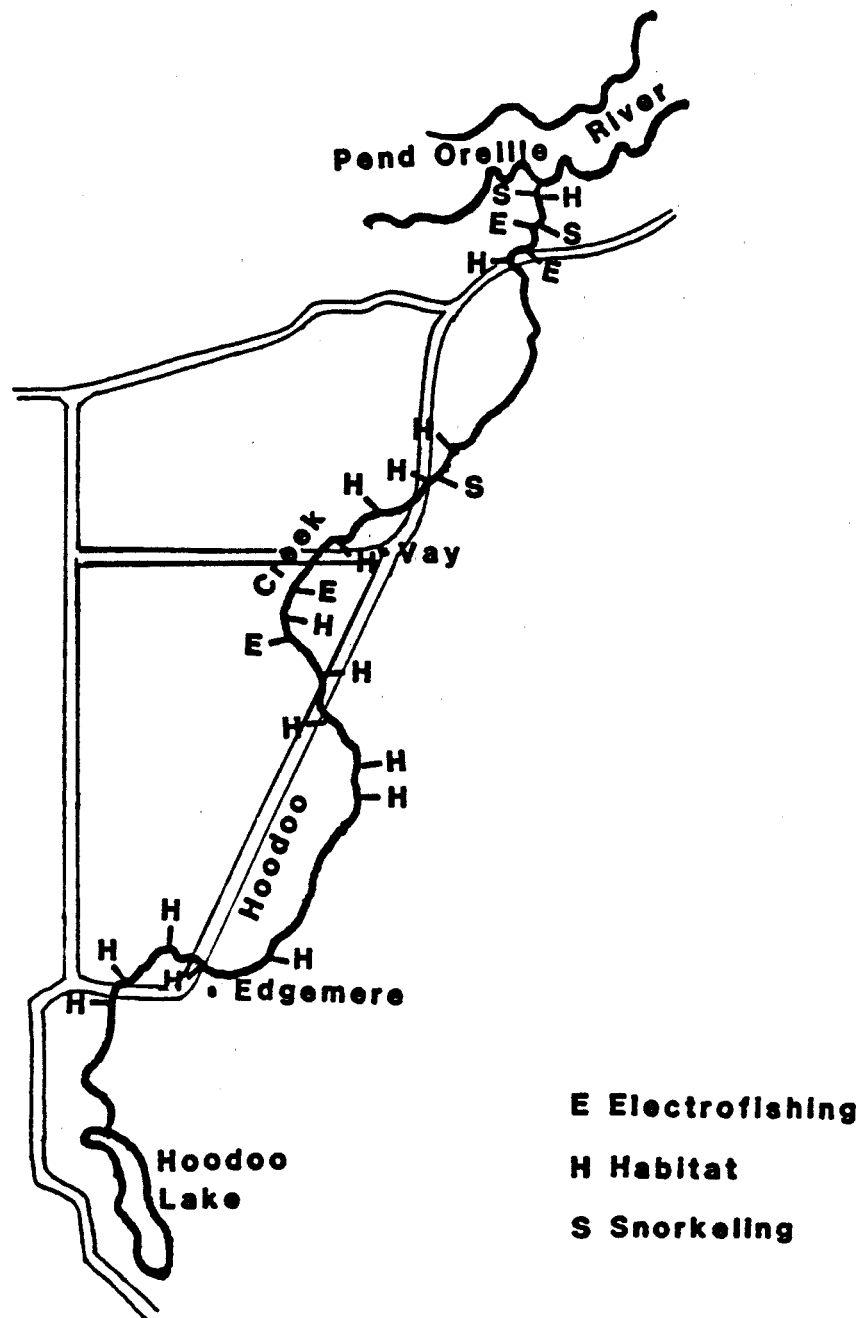


Figure 11. Locations of habitat, electrofishing, and snorkeling survey transects in Hoodoo Creek, Pend Oreille River drainage, Idaho, July 1987.

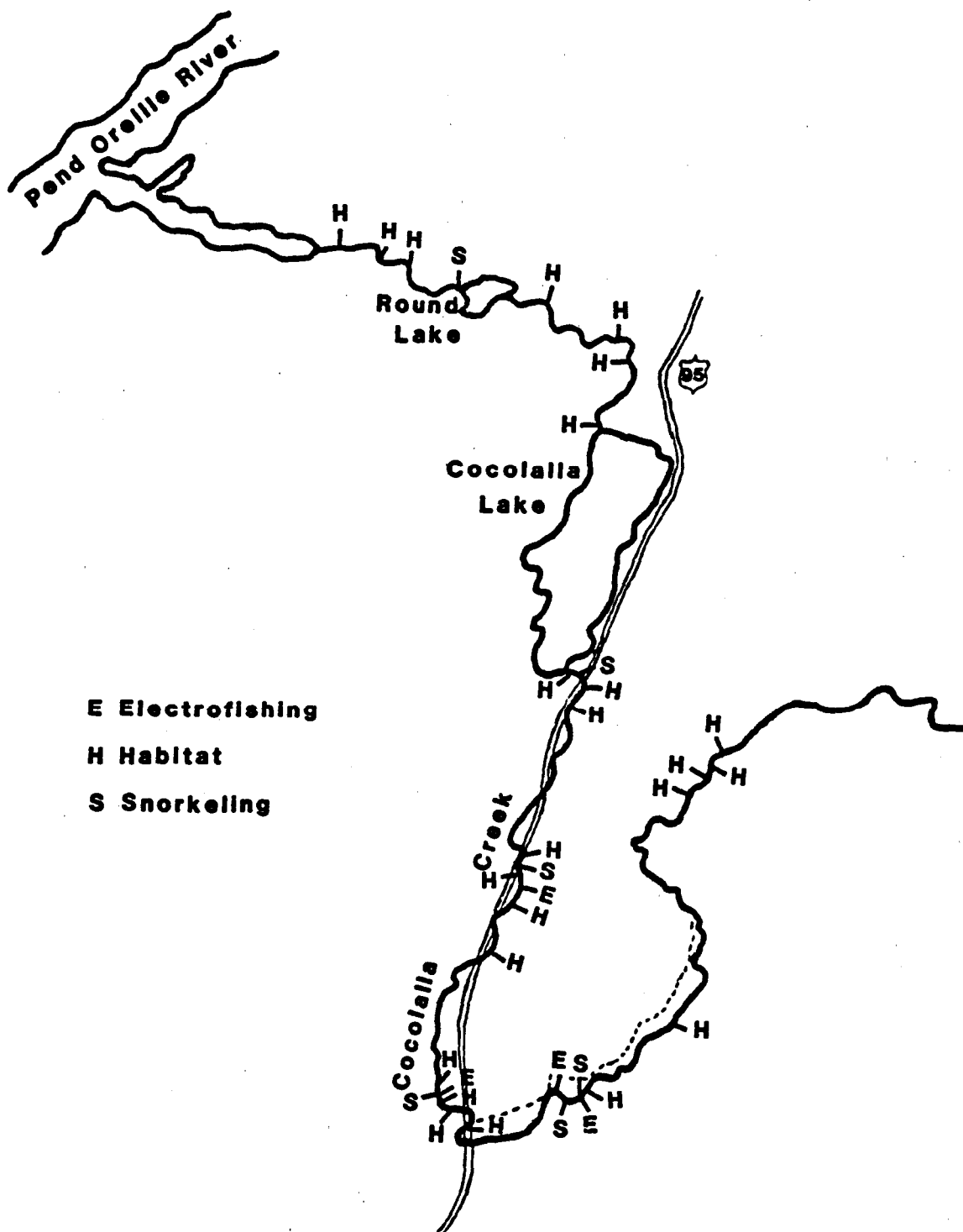


Figure 12. Locations of habitat, electrofishing, and snorkeling survey transects in Cocolalla Creek, Pend Oreille River drainage, Idaho, July 1987.

Table 13. General habitat characteristics of Cocolalla and Hoodoo creeks, Pend Oreille drainage, Idaho, surveyed in July 1987
(OV=overhanging vegetation and LOM=large organic matter).

Stream name	Reach length (Average width (ft)	Average gradient (%)	Pool/riffle ratio	Pool class				Spawning sites surveyed	Comments
					1	2	3	4		
Cocolalla Cr.	1.8	22	1	0.1:1	0	0	50	50	0	This stream section from the mouth upstream to Round Lake is predominately runs (65%) and riffles (29%). The substrate is large and small rubble and boulders. Instream cover is limited (8%) and primarily provided by OV.
	10.1	14	1	3.1:1	4	20	32	44	3	Runs are the predominate habitat type (66%), but pools are more prevalent (25%). Substrate is cobble and gravel covered with sand and silt. Instream cover improves (20%), primarily OV. Stream flows through open meadows with occasional small sections of good riparian cover.
	4.0	12	1	0.2:1	0	19	45	36	1	Riffles (47%) and runs (42%) predominate. Substrate is mostly cobble, boulders and bedrock. Instream cover is limited (8%) and consists primarily of boulders.
	0.9	5	2	0.7:1	0	31	50	19	10	Riffles (39%), runs (35%) and pools (26%) are more evenly represented. Substrate is largely clean cobble. Riparian vegetation and instream cover (37%) both are excellent. Instream cover provided primarily by aquatic vegetation and LOM.

Table 13. Continued.

Stream name	Reach length (mm)	Average width (ft)	Average gradient (%)	Pool/riffle ratio	Pool class				Spawning sites surveyed	Comments
					1	2	3	4		
Hoodoo Cr.	2.4	15	1	0.2:1	0	40	50	10	16	Riffles (54%) and runs (35%) predominate. Substrate is largely clean cobble, and spawning sites are fairly numerous. Instream cover is sparse (5%), but riparian cover is generally good.
	6.9	22	1	--	14	43	43	0	4	Runs (93%) and pools (7%) are the only habitat types recorded. Substrate is primarily sand and silt. Riparian habitat is virtually nonexistent, and instream cover (14%) is provided solely by aquatic vegetation.

Table 14. Densities of (fish/100 m²) of fish observed by snorkeling Cocolalla and Hoodoo creeks, Pend Oreille River drainage, Idaho, July 1987.

Stream	Section/Pool	Species ^a	Density (fish/100 m ²)
<u>Cocolalla Creek</u>	3/1	BK	941.8
	3/2	BK	3,272.3
	3/3	BK	343.0
	6/1	BK	12.8
		RB	124.1
	7/1	BK	65.7
	7/2	BK	102.7
	7/3	BK	23.9
	8/1	BK	74.1
	8/2	BK	75.9
	8/3	BK	13.5
	10/1	BK	134.5
	10/2	BK	64.6
	10/3	BK	208.1
<u>Hoodoo Creek</u>	1/1	BK	7.6
		RB	5.8
	2/1	BK	25.1
		BN	0.7

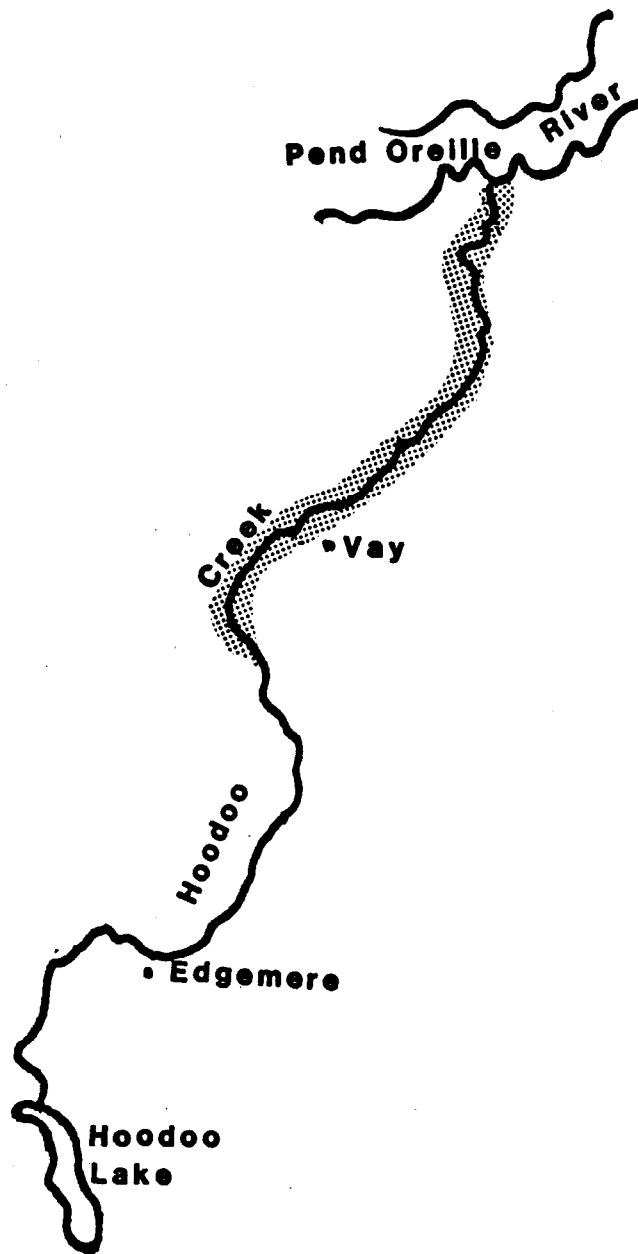


Figure 13. Distribution of rainbow trout in Hoodoo Creek, Pend Oreille River drainage, Idaho, July 1987.



Figure 14. Distribution of rainbow trout in Cocolalla Creek, Pend Oreille River drainage, Idaho, July 1987.

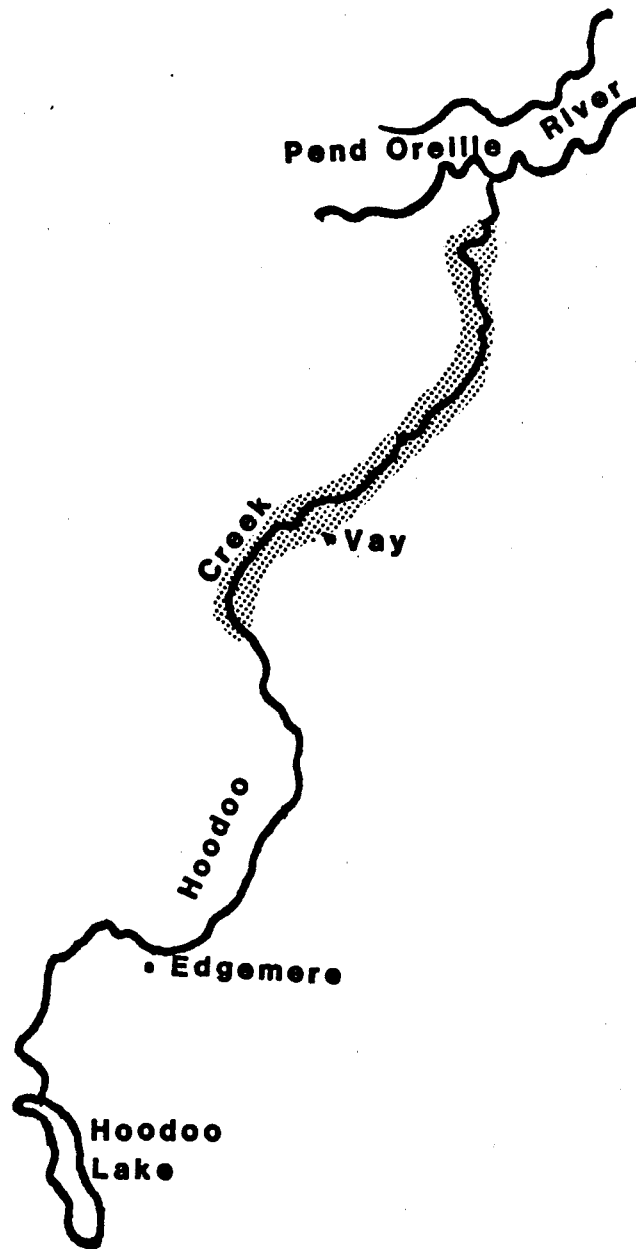


Figure 15. Distribution of brown trout in Hoodoo Creek, Pend Oreille River drainage, Idaho, July 1987.

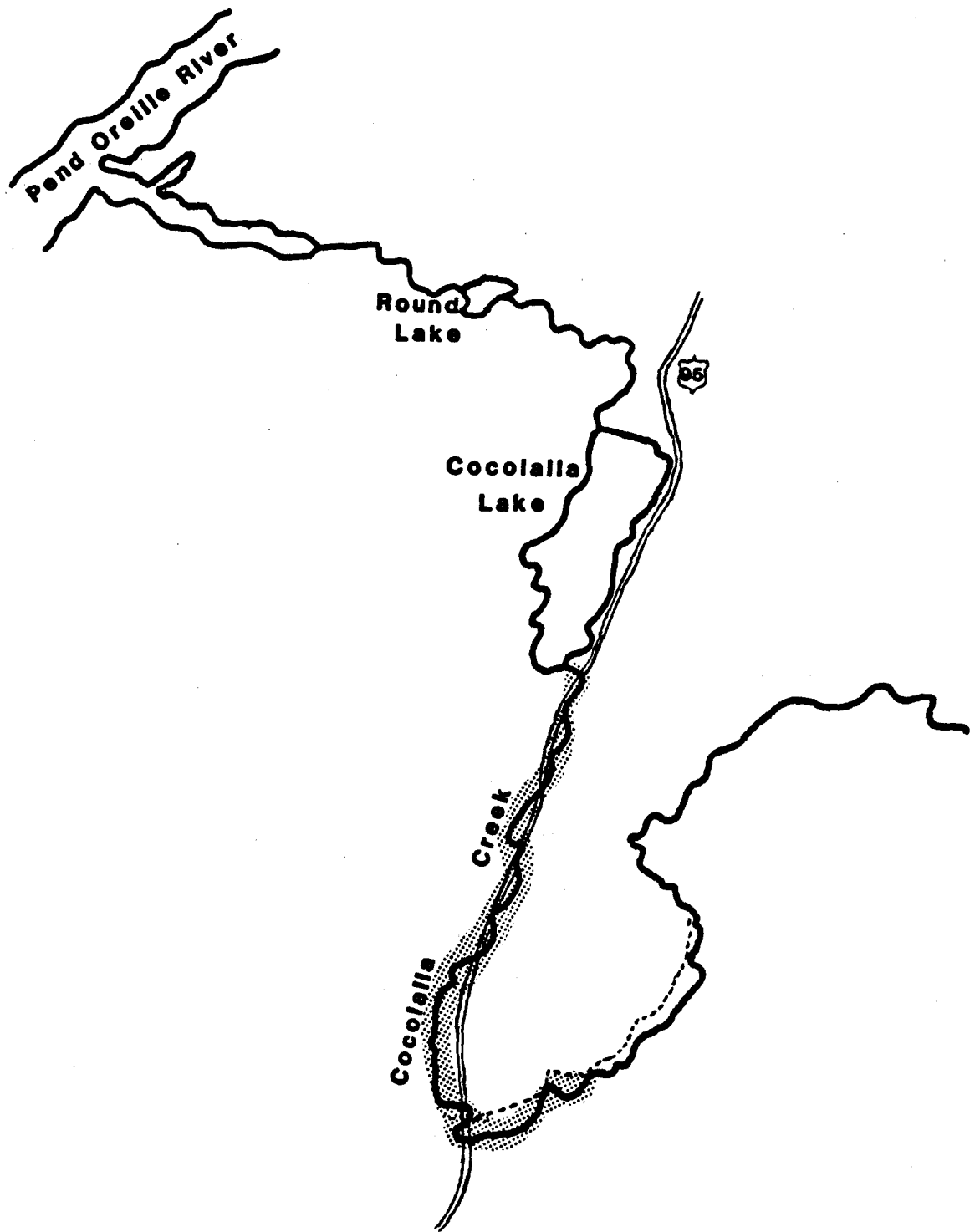


Figure 16. Distribution of brown trout in Cocolalla Creek, Pend Oreille River drainage, Idaho, July 1987.

Age and Growth

Of the 43 brown trout collected in Hoodoo Creek, scale samples for age and growth analysis were taken from only seven fish. Ages of fish ranged from 1 to 2 years old. Back-calculated lengths at annulus formation were 101 mm for age 1 fish and 143 mm for age 2 fish (Table 15).

Only five brown trout were collected from Cocolalla Creek, ranging in age from 1 to 3 years old. Two of the fish collected were age zero and were not included in estimates of back-calculated lengths at annulus formation. The average length at annulus formation was 84 mm for age 1 fish, 134 mm for age 2 fish, and 225 mm for age 3 fish (Table 16).

Scales from 49 brook trout collected in Cocolalla Creek were examined for age analysis. Fish ranged in age from 1 to 4 years. The back-calculated lengths at annulus formation were 101, 146, 189, and 223 mm for age 1, age 2, age 3, and age 4 fish, respectively (Table 17).

A total of 35 rainbow trout from Hoodoo Creek were examined for age and growth characteristics. The back-calculated lengths at annulus formation were 87 mm for age 1 fish, 145 mm for age 2 fish, and 213 mm for age 3 fish (Table 18).

Length and age frequency distributions for all species of salmonids collected in Hoodoo and Cocolalla creeks are represented in Figures 17 and 18.

Discussion

It appears the success of brown trout introductions in Hoodoo and Cocolalla creeks has been limited. The reasons for this do not appear to relate to habitat. Although neither stream contains prime salmonid habitat, good populations of brook and rainbow trout coexist with brown trout in these waters. One would expect since brown trout can inhabit slightly warmer streams than either brook or rainbow trout (Scott and Crossman 1973), they would survive fairly well in the relatively warm waters of the creeks. Food did not appear to be a limiting factor, as typical invertebrates (caddisflies, mayflies, etc.) were observed on stream substrate during habitat and snorkeling surveys.

Perhaps the high densities of brook and rainbow trout limit the amount of space available for the brown trout to invade. However, the literature reports that where brown trout have been introduced, or have invaded, they typically compete with brook trout (Scott and Crossman 1973) and the range of brook trout become restricted (Fausch and White 1981). Introductions of brown trout can also result in the establishment of self-sustaining populations of the two species (Marshall and MacCrimmon 1970).

Table 15. Back-calculated lengths (mm) at annulus formation and increment of growth for brown trout in Hoodoo Creek, Pend Oreille River drainage, Idaho, July 1987.

Age class	N	1	
I	6	102	--
II	1	91	143
Average length		101	143
N		7	1
Increment of growth		101	42

Table 16. Back-calculated lengths (mm) at annulus formation and increment of growth for brown trout in Cocolalla Creek, Pend Oreille River drainage, Idaho, July 1987.

Age class	N	1	2	3
I ^a	--	--	--	--
II	2	81	127	--
III		89	148	225
Average length		84	134	225
N		3	2	1
Increment of growth		84	50	91

^aNo age 1 fish were collected.

Table 17. Back-calculated lengths (mm) at annulus formation and increment of growth for brook trout in Cocolalla Creek, Pend Oreille River drainage, Idaho, July 1987.

Age class	N	1	2	3	4
I	17	102	--	--	
II	25	102	149	--	--
III	6	110	163	189	--
IV	1	101	146	189	223
Average length		152	202		
N		49	32	6	1
Increment of growth		103	45	43	34

Table 18. Back-calculated lengths (mm) at annulus formation and increment of growth for rainbow trout in Hoodoo Creek, Pend Oreille River drainage, Idaho, July 1987.

Age class	N	1	2	3
I	21	84	--	--
II	12	89	141	--
III	2	98	170	213
Average length		87	145	213
N		35	14	2
Increment of growth		87	58	68

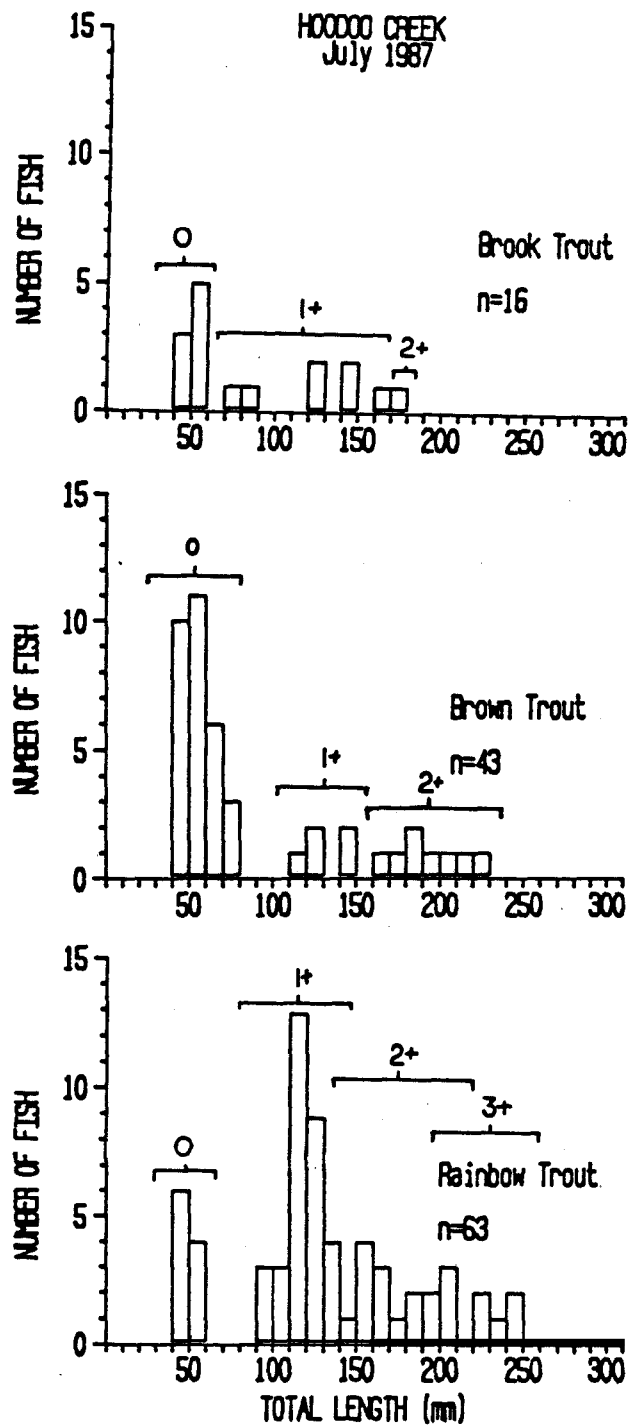


Figure 17. Length frequency and age distribution of brook, brown, and rainbow trout collected from Hoodoo Creek, Pend Oreille River drainage, Idaho, July 1987.

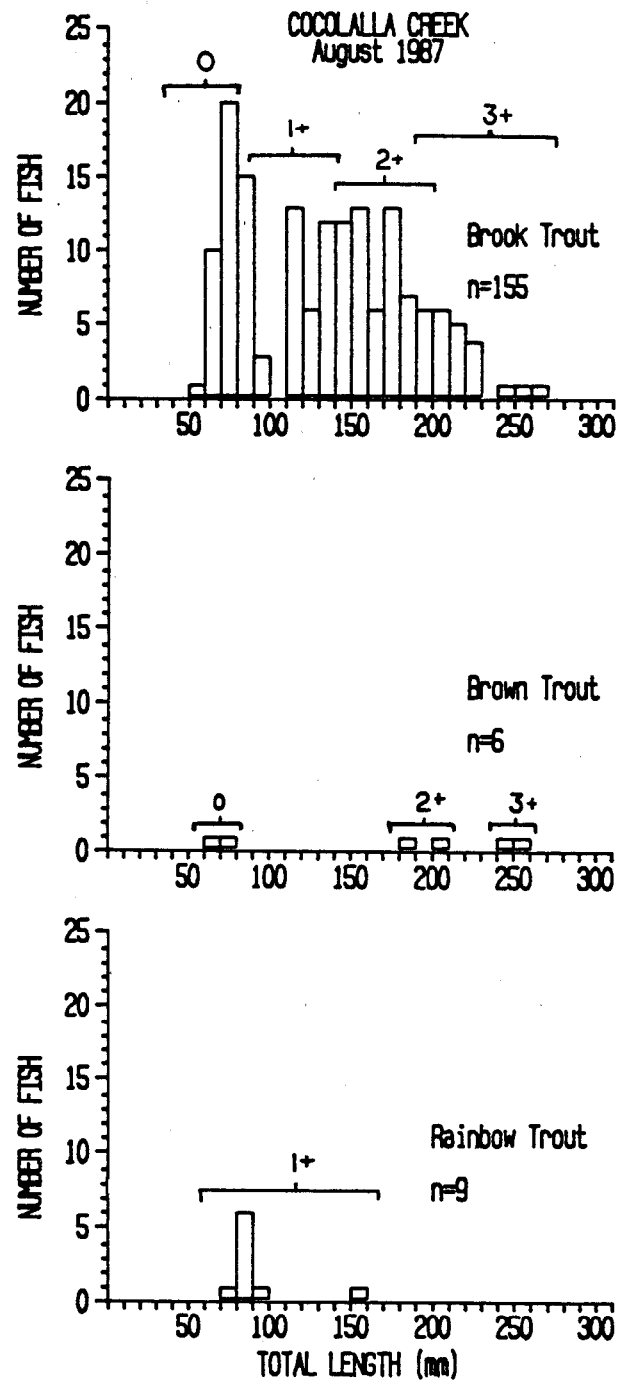


Figure 18. Length frequency and age distribution of brook, brown, and rainbow trout collected from Cocolalla Creek, Pend Oreille River drainage, Idaho, July 1987.

As previously suggested, the brown trout we have been stocking simply may not be surviving because they are so highly domesticated and do not transport well. Coupled with the high densities of other salmonid species in Cocolalla and Hoodoo creeks, the brown trout are at a severe disadvantage. We should evaluate stocking alternative strains of brown trout in northern Idaho streams and develop other methods of transportation to improve survival following release in the wild.

It also may be that larger brook and rainbow trout are preying on the brown trout *fry* immediately following release and during the first few days after release, although we have no data to support this. Stocking brown trout at night may be advantageous. We typically stock fry, but there may be some advantage to stocking fingerlings or even catchable size fish. Larger fish may have a competitive advantage with the large numbers of other salmonids in the streams.

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JOB PERFORMANCE REPORT

State of: Idaho

Name: REGIONAL FISHERY MANAGEMENT
INVESTIGATIONS

Project No.: F-71-R-12

Title: Region 1 Technical Guidance

Job No.: 1-d

Period Covered: July 1, 1987 to June 30, 1988

ABSTRACT

Region 1 management personnel provided private individuals, organizations, and state and federal agencies with technical guidance, review, and advice on projects associated with or having impacts on the fishery resource or aquatic habitat in Region 1. The guidance included written comments on 205 documents.

Author:

Ned J. Horner
Regional Fishery Manager

OBJECTIVES

1. To direct land use decisions in Region 1.
2. To provide other agencies and individuals with technical guidance and assistance pertaining to the fishery resources of Region 1.
3. To furnish technical assistance, advice, and comments to other agencies, organizations, or individuals regarding any items, projects, or activities that are associated with or may have an impact on the fishery resource or aquatic habitat of the region.
4. To comment on environmental impact statements, provide input regarding timber sales, small-scale hydropower projects, highway construction, stream alterations, EPA discharge permits, dock and boat basin development, gas and electrical transmission lines, land use planning, and other environmental impacts.

RECOMMENDATIONS

1. The loss of aquatic habitat due to land use development, stream and lake encroachment, and pollution is a continuing and expanding problem. Current demands for technical guidance and the level of involvement necessary to suitably influence these proceedings exceed the time management personnel are able to contribute. This type of activity is critical to slow the continual loss of aquatic habitat, but does not directly benefit the angling public by providing any enhancement through management of existing fisheries. To accomplish both the habitat protection and the more intensive fishery management necessary under increasing demand, additional manpower is necessary. A person dealing strictly with habitat protection issues would allow the Regional Fishery Manager and biologists more time to devote to aggressive, "proactive" fishery management.
2. Appropriate technical guidance to protect lands associated with streams, while minimizing damage to aquatic habitat, has been unavailable. Development of a booklet detailing alternatives for stream stabilization should be considered. A cooperative effort between the Department of Water Resources and the Soil Conservation Service may be useful. In the meantime, the Department of Water Resources should be encouraged to take a more active role in technical guidance or referral.
3. Additionally, impacts to Region 1 streams from roading and timber harvest have severely degraded trout and char spawning and rearing habitat. Research to date has focused on the impact of fine sediment on early life stages of salmonids. Many Region 1 streams are further impacted by excessive bedload sediment and loss of large woody debris,

resulting in major losses of summer and winter rearing habitat for all salmonid life stages. The need to better quantify the relationships between land use activities, stream channel dynamics, sediment transport and storage, and fish habitat should be a high priority of fishery research.

TECHNIQUES USED

Through personal contact, project and document review, and field inspections, we made comments and provided advice on projects or activities associated with or impacting the fishery resource or aquatic habitat of the region.

FINDINGS

During 1987, Region 1 responded to 205 written requests for comment from various agencies (Table 1). Over 90% of the Region 1 total were strictly fisheries related. Region 1 responded to 32% of the reported state total of written technical guidance, with Region 1 fisheries representing about 28% of the state's total comments on both fish and wildlife issues. The apparent disproportionate number of written comments handled by Region 1 fisheries management appears to be primarily associated with US Forest Service timber sales, as well as US Army Corps of Engineers, Water Resources, and Department of Lands stream alteration and shoreline encroachment permits. The majority of requests were handled by the Regional Fishery Manager in an attempt to free up the regional fishery biologists' time for data collection and analysis. The current technical guidance workload will require more equitable distribution between existing fish management staff personnel at the sacrifice of more active fisheries management.

Numerous presentations and programs were made to civic and sportsmen groups throughout the year.

In addition to routine comment and technical guidance, a number of issues required considerably more effort and involvement by regional personnel.

Timber Harvest

Several issues related to logging impacts on fishery habitat were dealt with in greater detail. Plum Creek Timber Company continued accelerated timber harvest on their lands in northern Idaho, generating concern about the short- and long-term impacts on watershed integrity and fish habitat. Several field tours were taken to obtain first-hand knowledge about their activities in progress and planned. Constructive criticism led to some modifications in riparian harvest that went beyond existing State Forest Practice Act guidelines. Ned Horner was appointed

Table 1. Written technical guidance comments by agency and Idaho Department of Fish and Game Region during 1987.

Region or Bureau	Bureau Land Management	Corps of Engineers	U.S. Forest Service	U.S. Bureau of Reclamation	Environ. Protection Agency	Idaho Dept. Lands	Health & Welfare	State Clearing-house	Dept. Transportation	Dept. Water Resources	Misc.	Total	Per cent
Region 1	6	14	71	--	12	51	--	--	6	28	17	205	32
Region 2	4	5	11		9	14	1	--	10	38	4	96	15
Region 3	8	13	30	4	1	16	--	--	12	16	17	117	18
Region 4	23	7	--	--	8	--	--	--	2	1	6	47	7
Region 5	10	8	11	1	2	11	1	--	5	12	9	70	11
Region 6	3	12	24	2	3	18	--	--	4	19	22	107	17
Program Coordination	--	--	--	--	1	--	1	--	--	--	3	5	>1
Fisheries	--	--	--	--	1	--	--	--	--	--	--	1	>1
wildlife													
Total	54	59	147	7	37	110	3	--	39	144	78	648	
Percent	8	9	23	1	6	17	>1	--	6	18	12		

as an advisory member of the Forest Practices Act Committee to provide input on fish habitat needs. Input was also provided to the Panhandle National Forest on their approved Forest Plan. The region will continue to work closely with both Forest Service Districts and Supervisor's Office to insure that fish habitat needs are considered.

Regulation Development

Considerable time was devoted to developing a comprehensive regulation package to meet management goals consistent with regional and statewide plans. Major emphasis was placed on restrictive regulations to enhance depressed wild trout populations, while waters supported primarily by hatchery supplementation were liberalized.

A series of six public meetings were held in April to discuss fish population status and determine management preferences from the public. Regulation proposals were then developed and six additional meetings were held to obtain comments on our proposals. Several changes were made as a result of public input prior to the Commission's approval of the regulations in October. We had 310 people attend the 13 public hearings in April, August, and October.

Considerable opposition to certain regulations surfaced after the regulations were printed and made public. The public felt there had not been adequate opportunity for input and the regulations were too restrictive. The regulations for Lake Pend Oreille and the cutthroat package for the Spokane drainage received most of the criticism.

A decision was made to provide an additional opportunity for public input on the Pend Oreille regulations and 414 people attended a public hearing. Support for trophy management of the unique Gerrard rainbow was relatively strong. The major concern of anglers appeared to be loss of bank and small tackle opportunities as a result of a closure on cutthroat and greatly reduced limit on bull trout. Regulations were adjusted to better meet social needs while still accomplishing the goal of enhancing fisheries supported by wild native salmonids.

Wolf Lodge Creek

Excessive bedload sediment in the lower portion of the creek has created a situation where existing channel capacity cannot handle normal bank full discharges. Bank destabilization, property damage, and loss of critical spawning and rearing habitat for westslope cutthroat has resulted. The causes of the problem are not well understood. Landowners' attempts to protect their property have often been ineffective and have aggravated the existing problem. Landowners have become frustrated with agency involvement to date. We felt that something had to be done to attempt to resolve these problems, or the rapid loss of the adfluvial cutthroat fishery in Coeur d'Alene Lake would result.

Discussions continued in 1987 with numerous agencies and Wolf Lodge Creek landowners to identify and hopefully resolve fish habitat loss-private property damage problems in the lower end of Wolf Lodge Creek. Regional personnel continued discussions with the Forest Service, Soil Conservation Service, Idaho-Washington Rural Conservation Districts, Water Resources, US Army Corps of Engineers, County Planning and Zoning, Division of Environment, and private landowners.

Dr. Don Reichmuth from Geomax Corp. was hired as a consultant to provide input on stream instability problems and develop a comprehensive plan to address the problem. Low level air photos were taken to develop a detailed map. The entire stream was walked to gather detailed information on problem areas. Landowners were given a course in stream channel dynamics as part of an educational process that will lead to changes in riparian management.

A detailed plan is being developed, and rocks are being stockpiled for grade control structures. Implementation of the plan will depend on available funding and cooperation from landowners, and regulatory agencies.

Fish Habitat Improvement

The fishery management staff actively pursued habitat improvement projects on both streams and lakes in 1987. Drop-log structures were built on Hayden Creek with the assistance of US Forest Service and the North Idaho Fly Casters. North Idaho Fly Casters obtained a \$5,000 grant from Fish America Foundation to match with \$5,000 of Challenge Grant money from the Forest Service to complete habitat improvement work on Teepee Creek. Pools were created by constructing artificial channel constrictions and placing boulder clusters. We assisted with developing another proposal for similar work in the North Fork of the Coeur d'Alene River in 1988.

The region worked closely with US Army Corps of Engineers, US Department of Transportation, and Washington Construction Company to improve habitat in the mainstem St. Joe River between Marble Creek and Avery. Boulder clusters were placed in 13 miles of river that previously had little or no instream structure. The "fish rocks" were typically four to eight feet in diameter and were placed with an 11 cubic yard front end loader operating in the river channel. A fisheries biologist was hired to guide the loader operator to ensure proper placement of rocks. We are hopeful these structures will increase the holding capacity of this section of river substantially.

Spiny ray fish habitat was enhanced by sinking Christmas trees and large (40-60 foot) trees in Hayden Lake. The large trees are suspended horizontally with anchors attached to the tree with 1/4-inch cable and capped five gallon plastic buckets used for floats. These structures are anchored in 20 to 30 feet of water to provide bass and crappie habitat. Conservation officers also enhanced habitat on the lateral lakes with wood structures and the assistance of sportsmen.

Submitted by:

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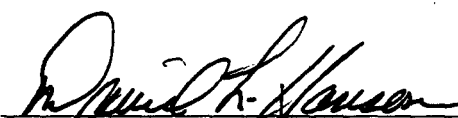
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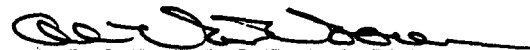
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